EXPORT NUMBER

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
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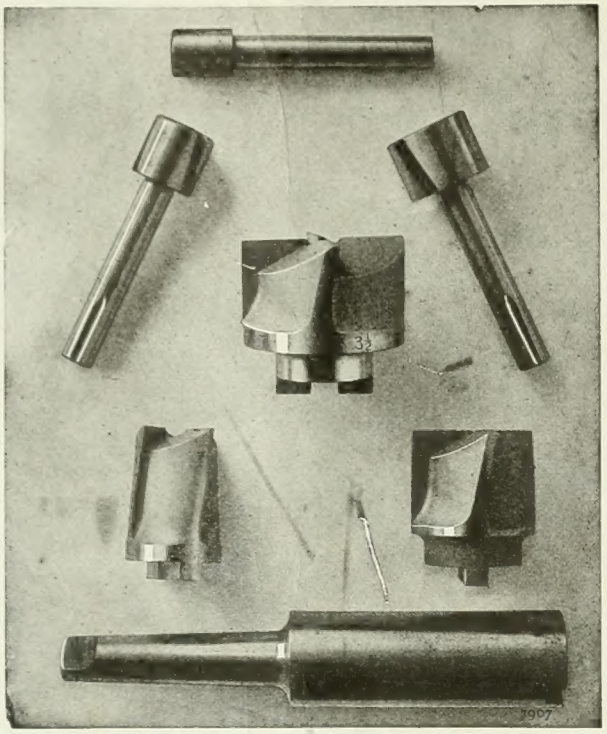

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GUIDES

Are of hardened tool steel. They are held in place by means of a set screw in the holder engaging a V-slot in the shank of the guide.

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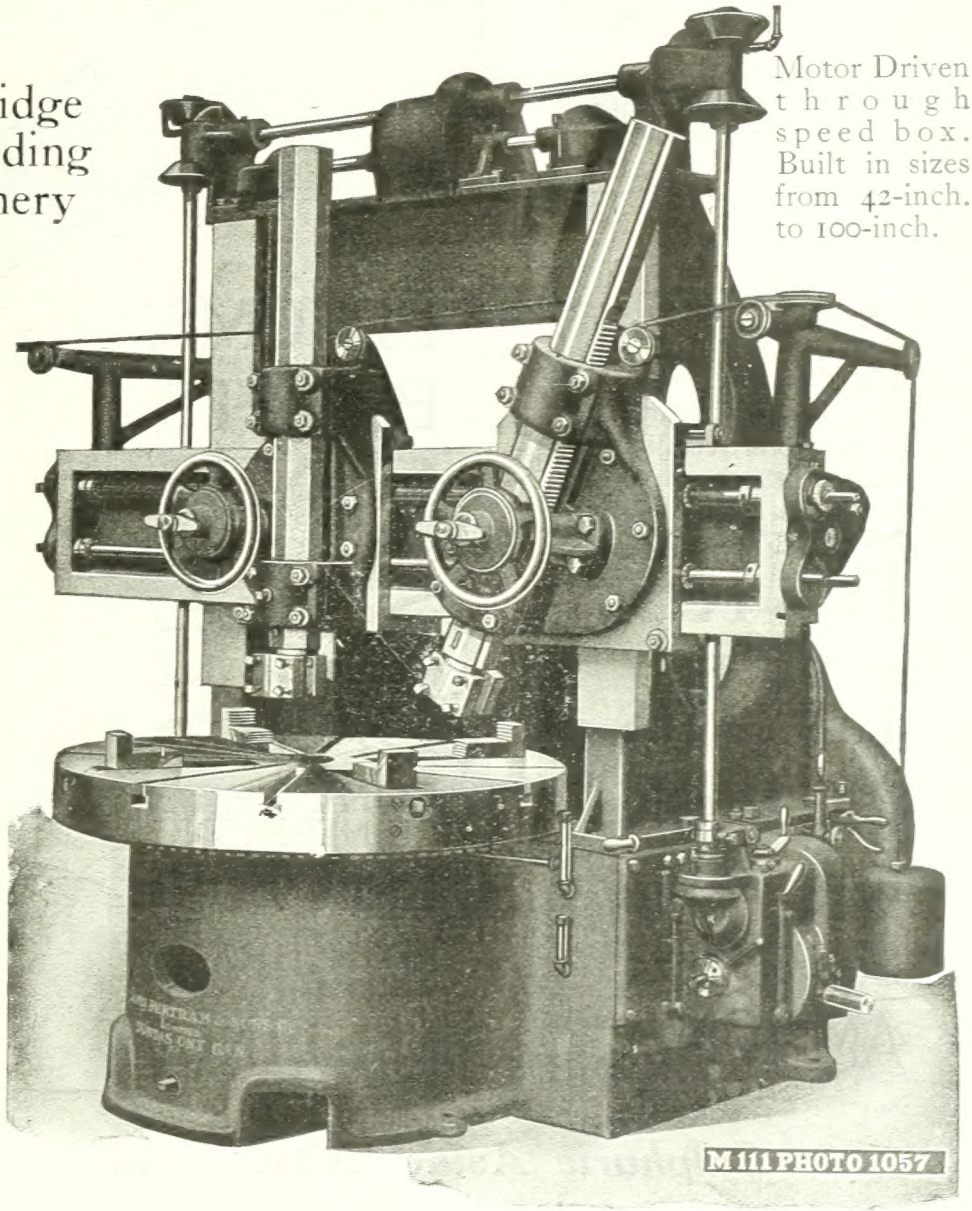

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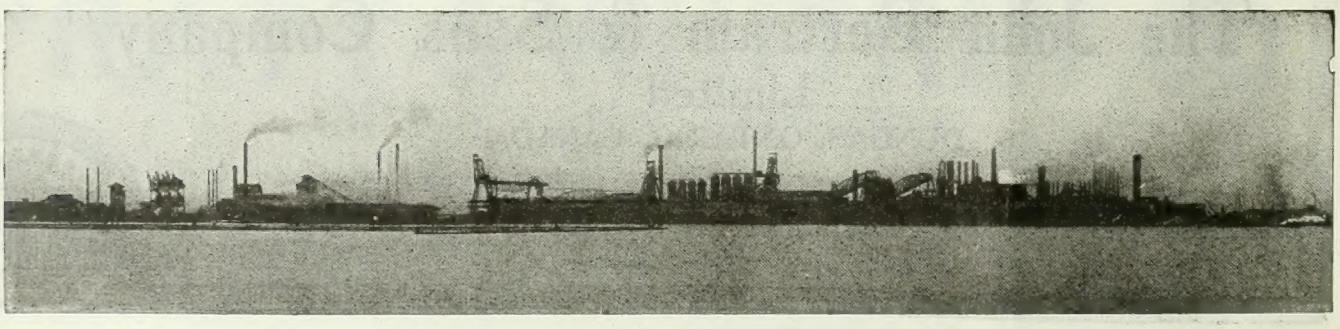

General View of the Plant of the Algoma Steel Corporation from the Waterfront.

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TO uphold the Glory we have jointly earned—to honor our noble dead—to comfort the wounded, and extend to the men returned the hand of prosperous welcome, we must cast aside all forebodings and face the future with unbounded courage and confidence and, without a shadow of doubt, declare to the World that this Nation, which was so quickly and successfully transformed to a War basis, can be depended upon to revert to Peace conditions with equal success. The buyer and seller must recognize their duty to the Nation and co-operate fully to the end that all products that can be produced in Canada by Canadian workmen shall not be purchased elsewhere.

OUR Duty is plain; Canada with Canadian labor and capital can produce, manufacture and distribute products sufficient to keep the wheels of industry turning to the limit. The song of Prosperity and Happiness should ring out all over the land. Let us sincerely pledge to the extent of our needs, to purchase materials produced in Canada by Canadian Workmen, and the result of our efforts will return to us the Blessings of a Prosperous and Happy Nation.

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Horse Shoes
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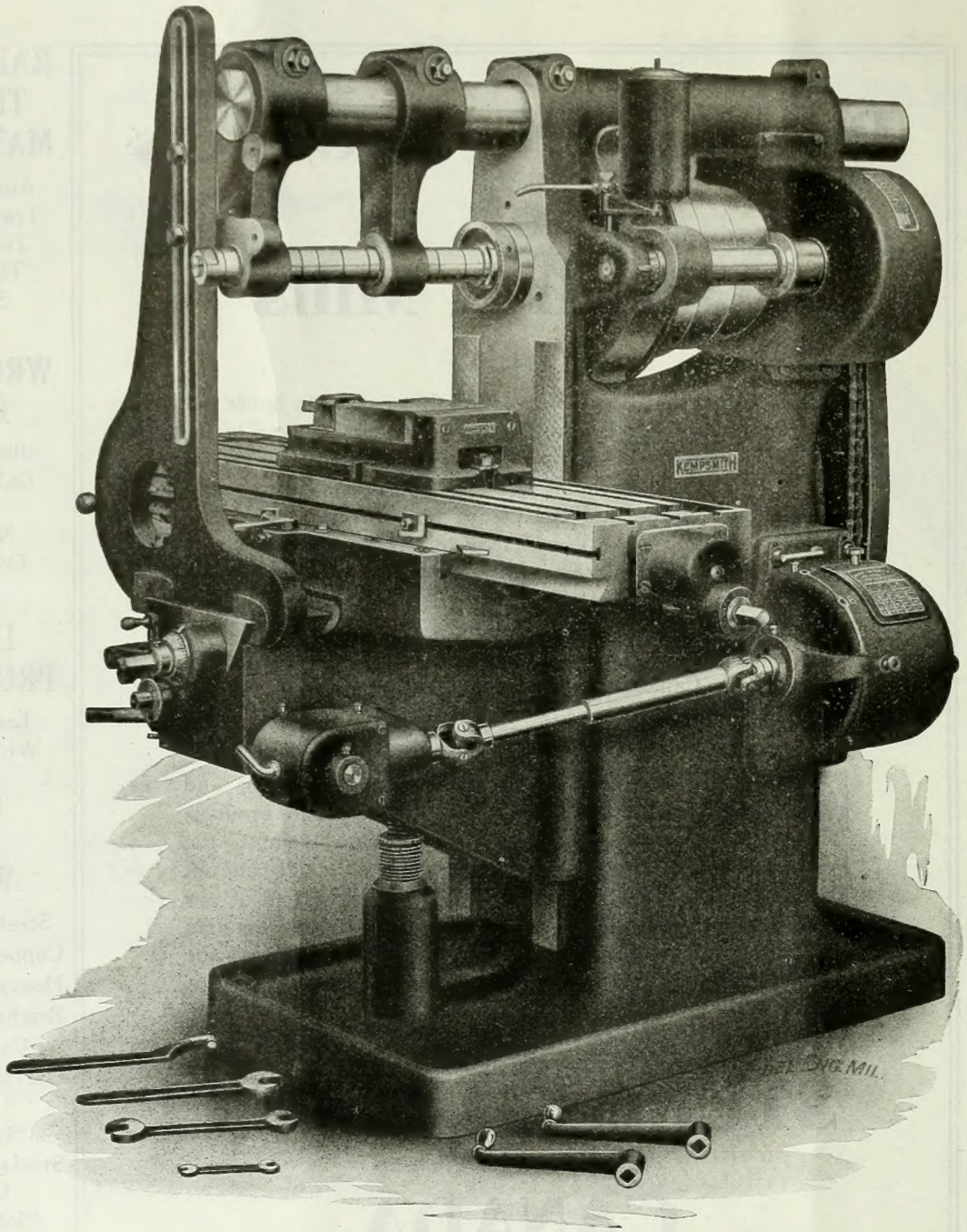
KEMPSMITH



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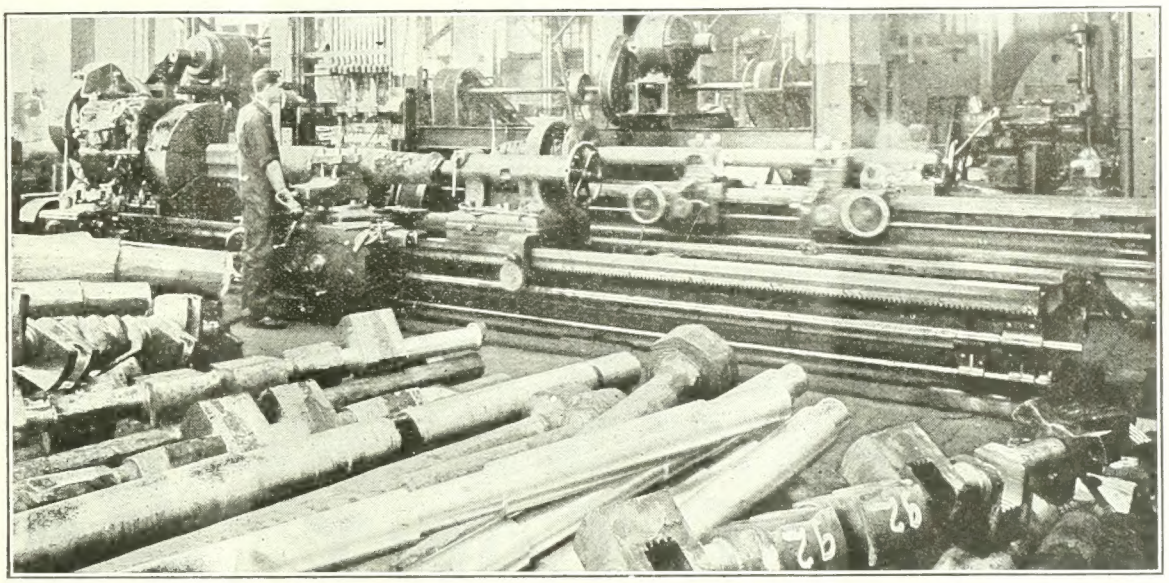
BRIDGEFORD

Heavy Duty Lathes



The above photograph shows a Bridgeford 27″ Manufacturing Lathe finish boring a cast-iron transmission housing for the new Fordson Tractor.

The diameter of housing is 19⅛″ and the limits of accuracy are .002″.

Maximum production is a requirement in the Ford plant and that is why a Bridgeford was selected to do the work. The Bridgeford turns out 80 pieces per day of 8 hours, which is excellent production.

There's a Bridgeford for every heavy duty lathe requirement. Bridgefords are in operation in all parts of the world on all kinds of duty. The line includes Heavy Geared Head Engine Lathes from 24″ to 72″ swing, Cone Driven Engine Lathes, Axle and Journal Truing Lathes and Manufacturing Lathes of 27″ and 30″ Swing.

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We are in a position to make prompt deliveries.

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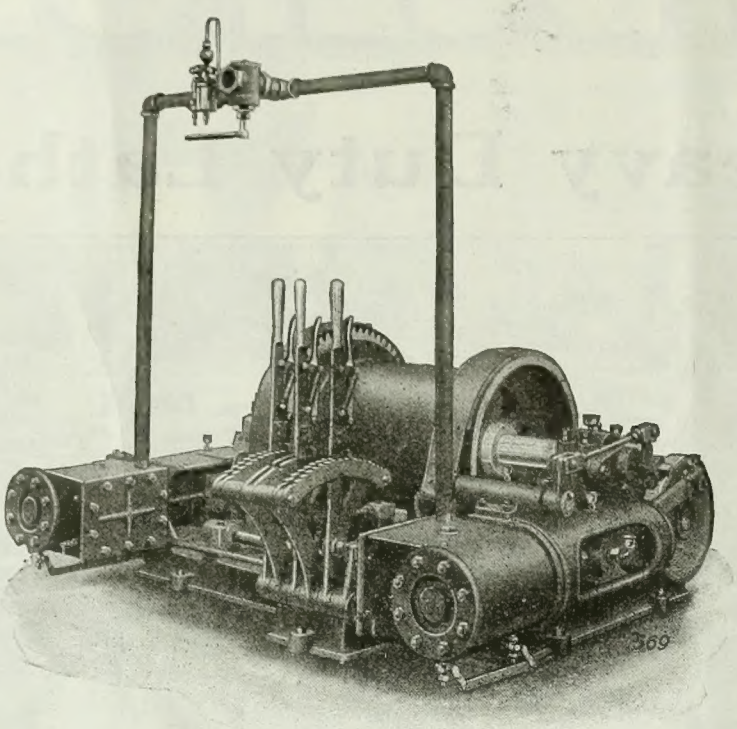
Manufacturers of Heavy Duty Lathes for more than 20 years.

BRIDGEFORD

THE "CIRCO" MINE HOIST



"CIRCO" Mine Hoists have many excellent features of design which are not usually found in machines of this class. The cylinders are cast separately from the frames, and are interchangeable, thus permitting one spare cylinder to be used on either side, and doing away with the necessity of buying a new frame, should one of the cylinders be accidentally damaged. The crosshead guides are bored and the end of the frame faced at the same setting, insuring accuracy and permanency in alignment. A raised ledge around the crosshead guides prevents oil from dripping, which is a common fault in the ordinary mine hoist.

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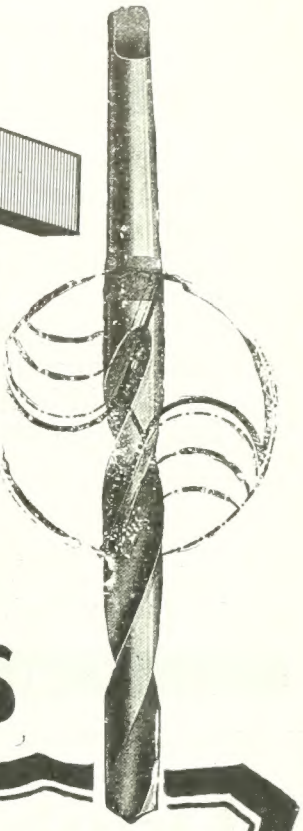

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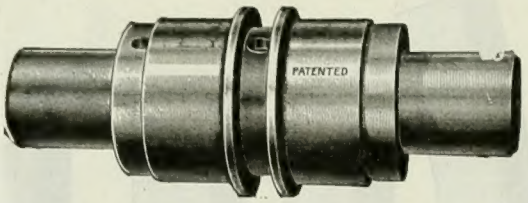

It takes time to do anything well, but the results usually justify the effort. Johnson clutches represent years of practice on one particular line. Our long experience in studying the demands of the trade, in refining our methods, in recording performances, and in selecting materials—all this is reflected in the present quality of our product.

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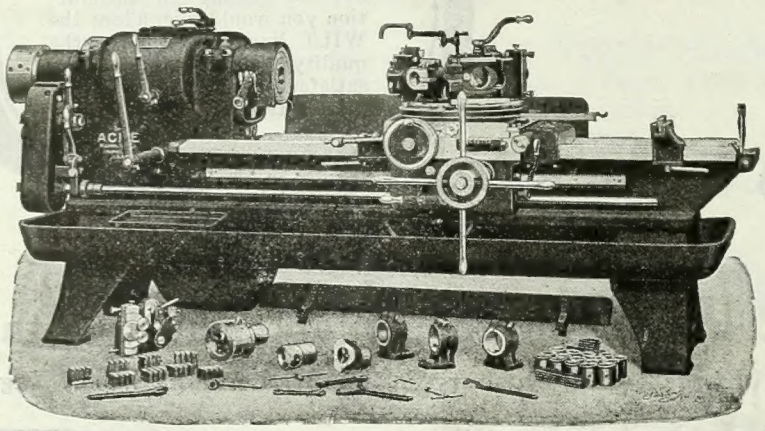
This Cincinnati Acme Flat Turret Lathe is a double-production, geared head machine of the sliding gear type. It operates on minimum power because the only gears running are those doing the actual work.

This machine saves remarkable time and labor machining either bar work or chuck work up to 16 in. diameter.



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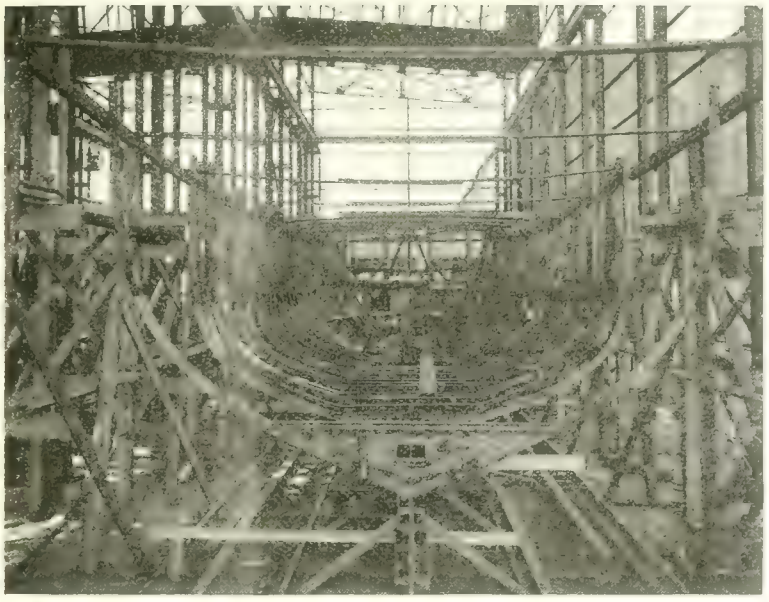

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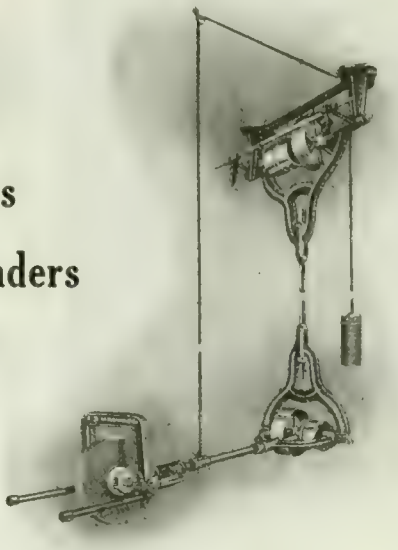

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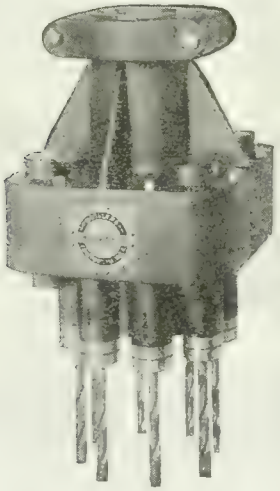

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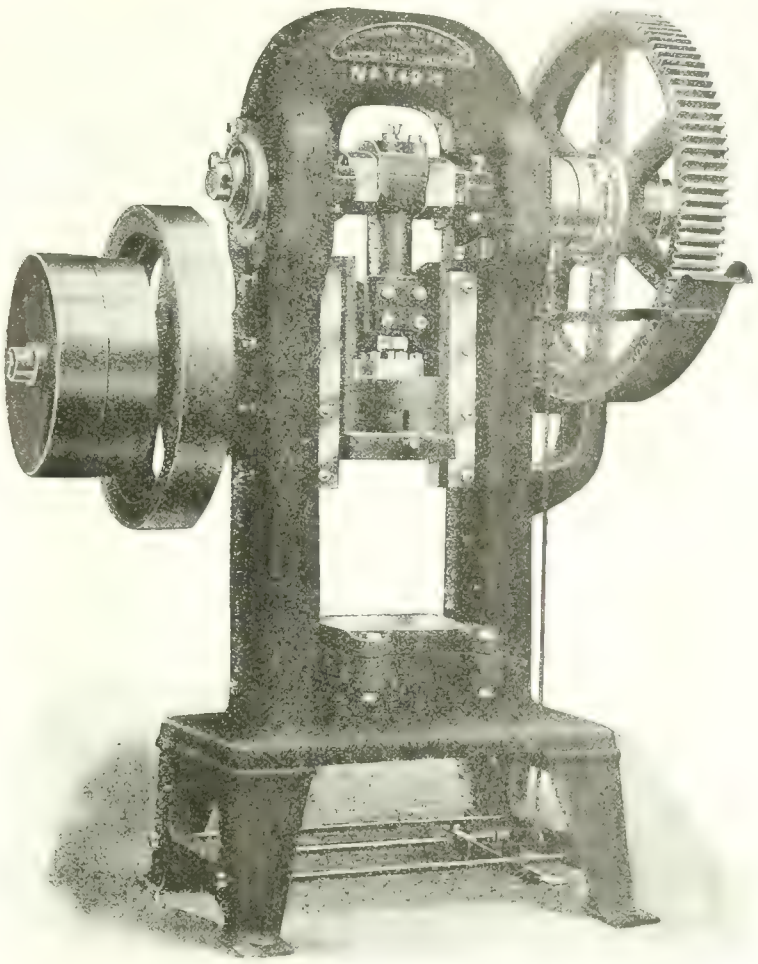

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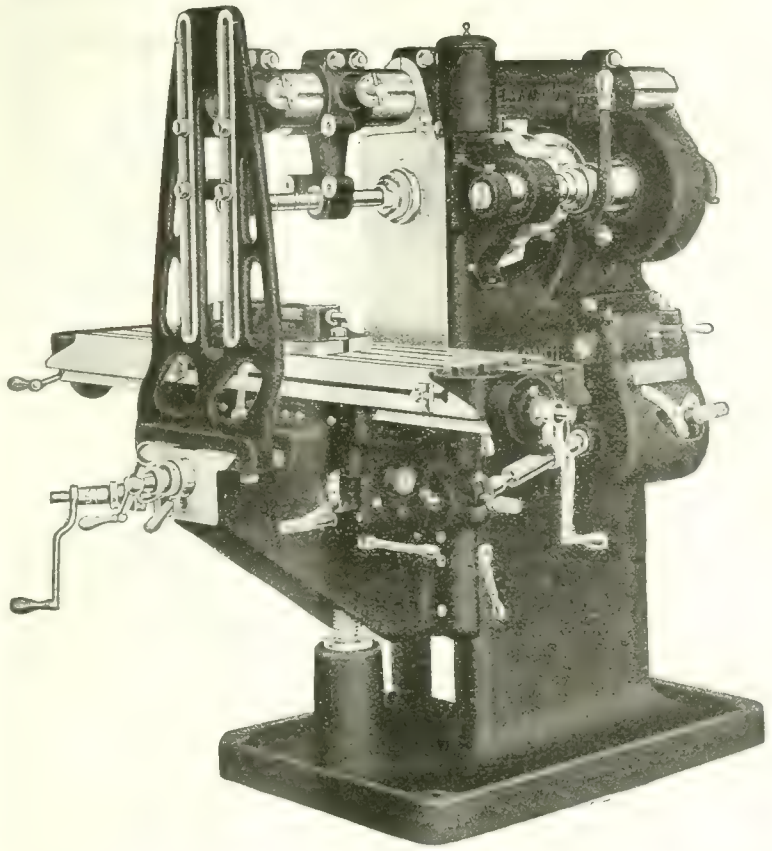

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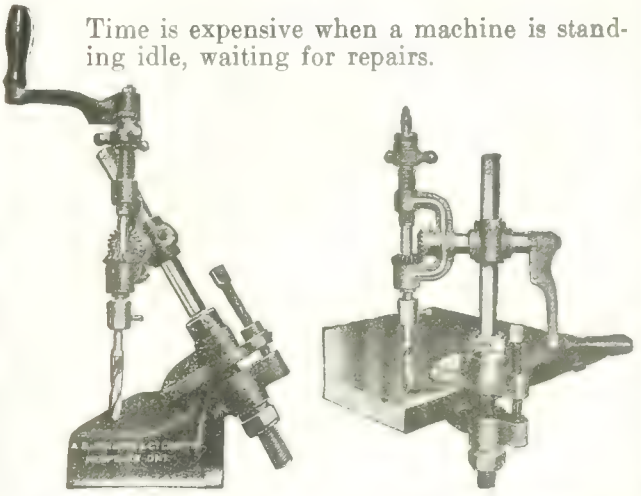

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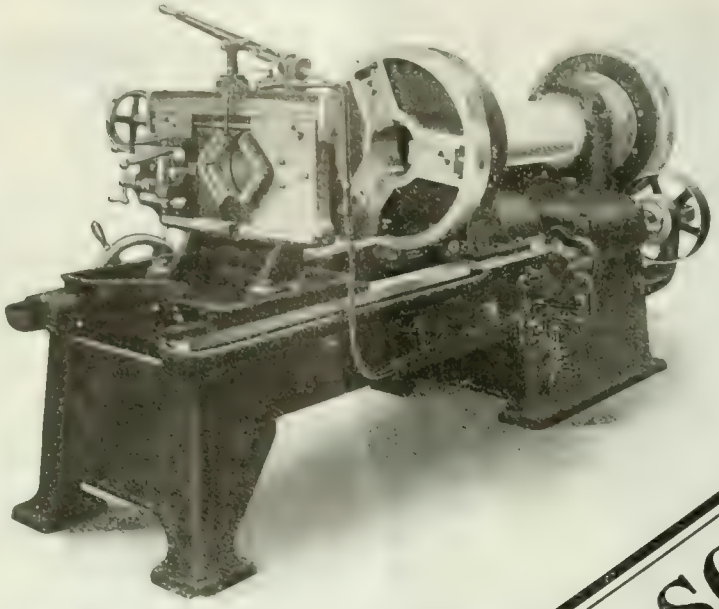

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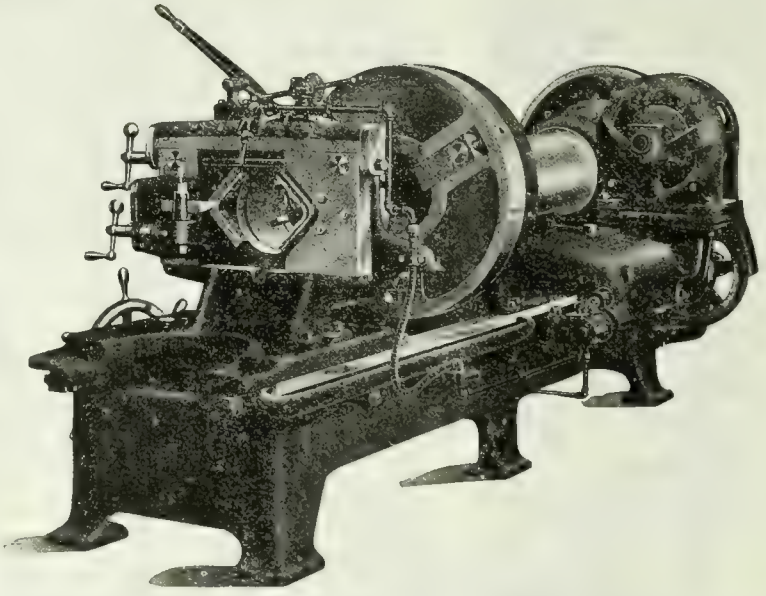

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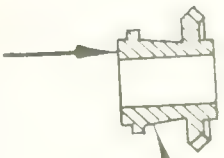
Piston Rods
Rough Turned—Annealed—Heat Treated

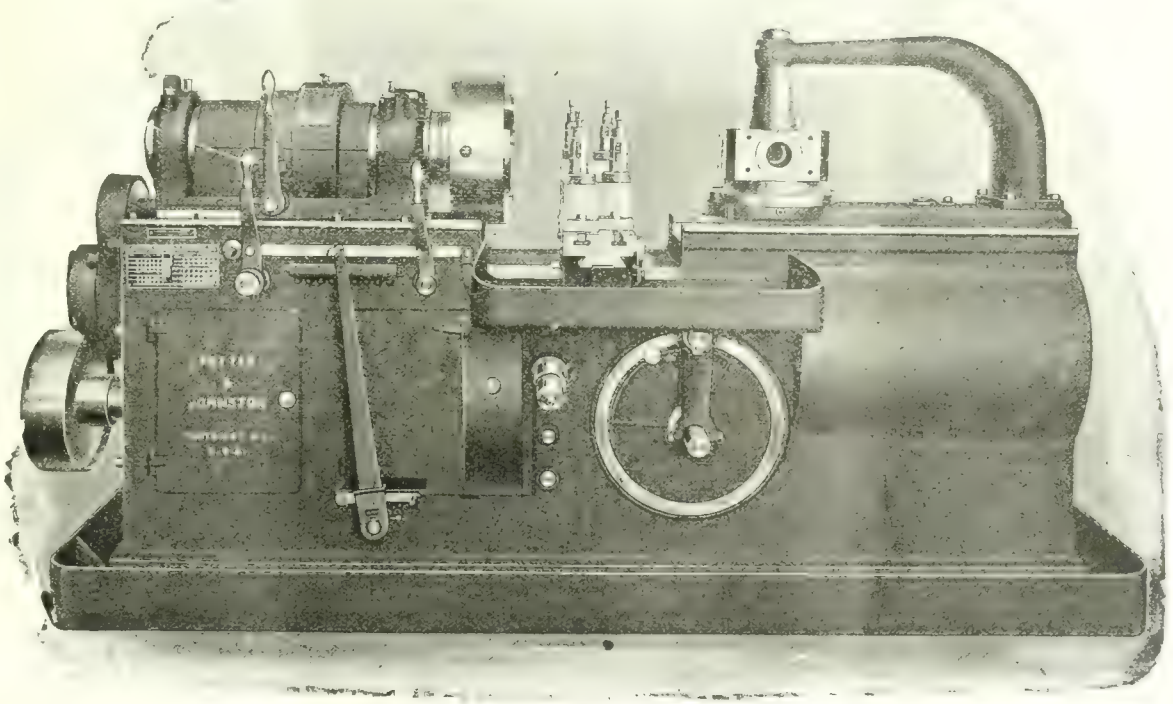
High Speed Steel

General Steel Company
Milwaukee, Wisconsin
DETROIT—823 Dime Bank Building

Within the Range
of the
POTTER & JOHNSTON
MANUFACTURING AUTOMATICS

From the 2 ½in. Bobbin Gear of a Textile Machine
To the 40in. Fly Wheel of a Gas Engine





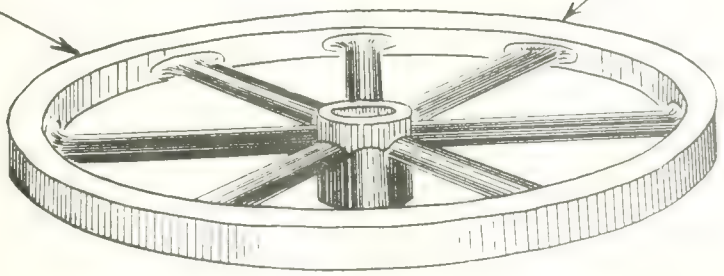
6A Manufacturing Automatic

BULLETIN 39

Have you any duplicate work, castings of iron, bronze or steel? Or cut-off stock? Or forgings? Up to 40 inches diameter—15 inches long.

If you have, you come within the range of Potter & Johnston Manufacturing Automatics.

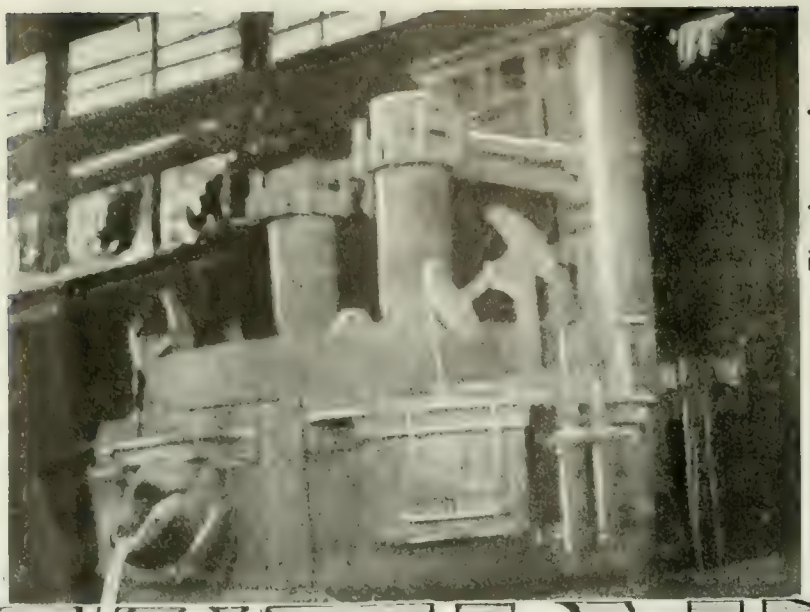
One operator runs from 2 to 6 P & J's.



Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL Co., Limited

HEAD OFFICE: 1501 ROYAL BANK BUILDING, TORONTO, CANADA
WORKS AND WAREHOUSE: GALT, ONT., CANADA



ELECTRITE

High Speed Steel

SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces — entirely infallible, automatically regulated, delivering the same result time after time.

Uranium — This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

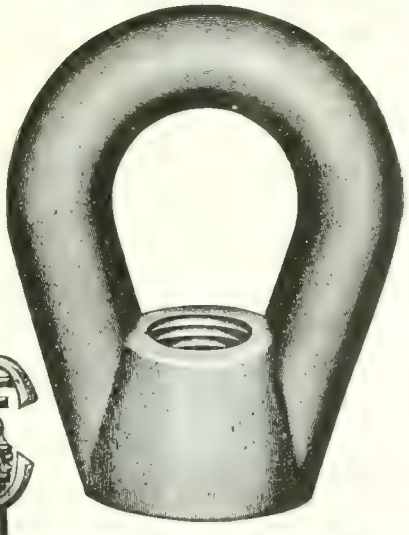
Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.
LATROBE, PENN.

URANIUM

CANADA
FOUNDRIES & FORGINGS
LIMITED

Eye Nuts



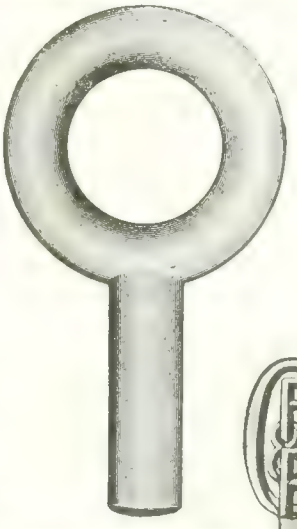
DROP FORGED STEEL

all sizes

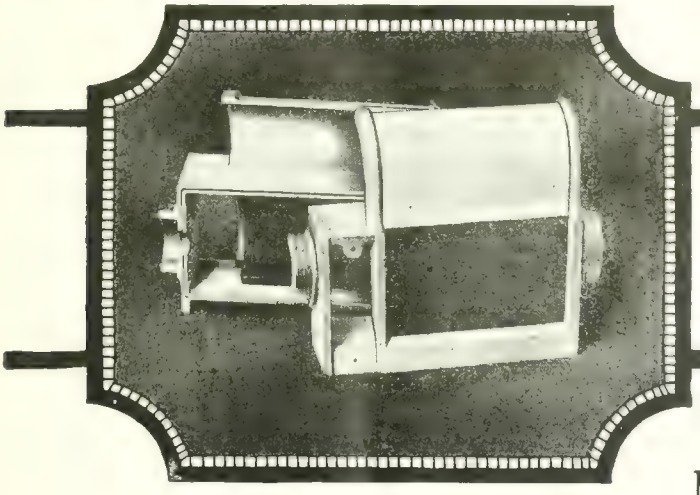
Produced at

Canadian Billings & Spencer Plant

Welland Canada



Eye Bolts



FRANKLIN DIE-CASTINGS

The Possible Manufacturing Economies

GO over your product again. There may be some simple little part, or a complicated one, which would serve its purpose as well, or better, if produced by our die-casting process. If so, you will economize in manufacturing costs. And if we undertake the job the efficiency of your product will not suffer because it is not only our business to produce die-castings but to see that they are not wrongly applied.

Let us put our 27 years' die-casting experience on your *possible manufacturing economies.* Special attention given to Canadian manufacturing requirements for fuller development.

We are equipped to cast in aluminum, lead, tin and zinc base alloys.

Send sample or blueprint for recommendation and estimate. Ask for Booklet "C."

Franklin Manufacturing Co., 746 Gifford St., Syracuse, New York, U.S.A.

VULCAN

NON-SHRINKABLE OIL HARDENING

DIE STEEL

was used to make these Government Gauges

Gauge No. 1		Gauge No. 2
2.506	Outside Diameter	2.016
2.433	Pitch Diameter	1.951
8	Threads per inch R. H.	12
1 in.	Length of Gauge	1⅛

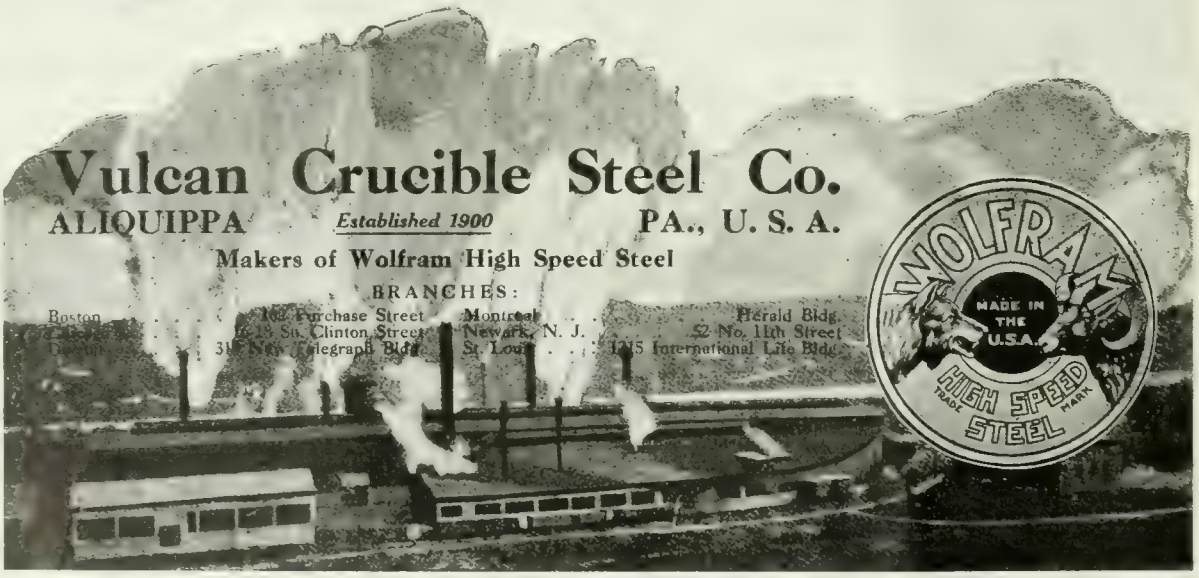
TOLERANCES

Pitch Diameter—Plus or minus .0002
Lead—Plus or minus .00025 per inch of length
Angle—Plus or minus 5 minutes

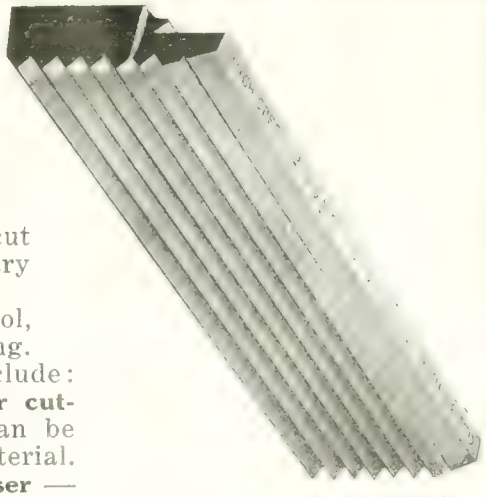
Allowance on pitch diameter for grinding .003 to .005, depending on diameter of gauge.

Change in Hardening { Lead not over plus or minus .001 per inch of length. Diameter not over plus or minus .001 per inch of diameter.

Name of manufacturer of gauges furnished on request.


Vulcan Crucible Steel Co.
ALIQUIPPA Established 1900 PA., U. S. A.
Makers of Wolfram High Speed Steel
BRANCHES:
Boston 166 Purchase Street
Detroit 31 New Telegraph Bldg.
Chicago 6 So. Clinton Street
Montreal Herald Bldg.
Newark, N. J. 52 No. 11th Street
St. Louis 1015 International Life Bldg.
WOLFRAM
MADE IN THE U.S.A.
HIGH SPEED STEEL
TRADE MARK

The Chaser is the Factor in Threading



Any die will cut a thread—that is its purpose; but to cut threads profitably and threads that are better than ordinary requires a **different chaser.**

The Landis Die, embodying the characteristics of a lathe tool, gives you those features necessary for successful threading. These features include:

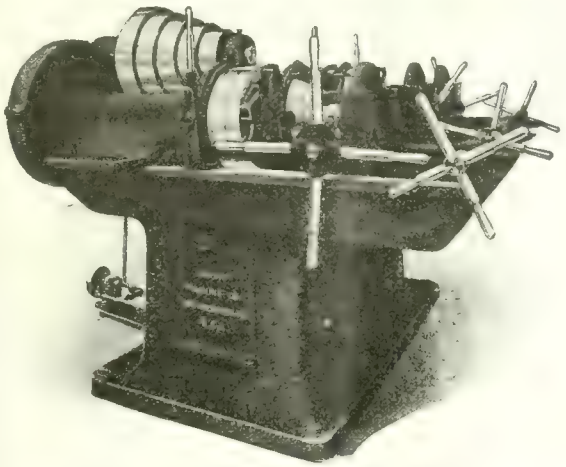
Variable rake or cutting angle which can be ground to suit material.

Long life of chaser — you have three inches of available cutting stock which gives a life twenty times that of other dies.

No annealing, hobbing and retempering—just grind the chaser on the end and you have a new die.

Interchangeability—any one of a set of chasers can be replaced without renewing the entire die.

Tangential disposition—chaser has a line contact with the stock, reducing the friction to a minimum and doubling cutting speeds.



Why not investigate this die and learn just what it can do to your threading requirements? Catalogue No. 24 will give you details.

LANDIS MACHINE COMPANY

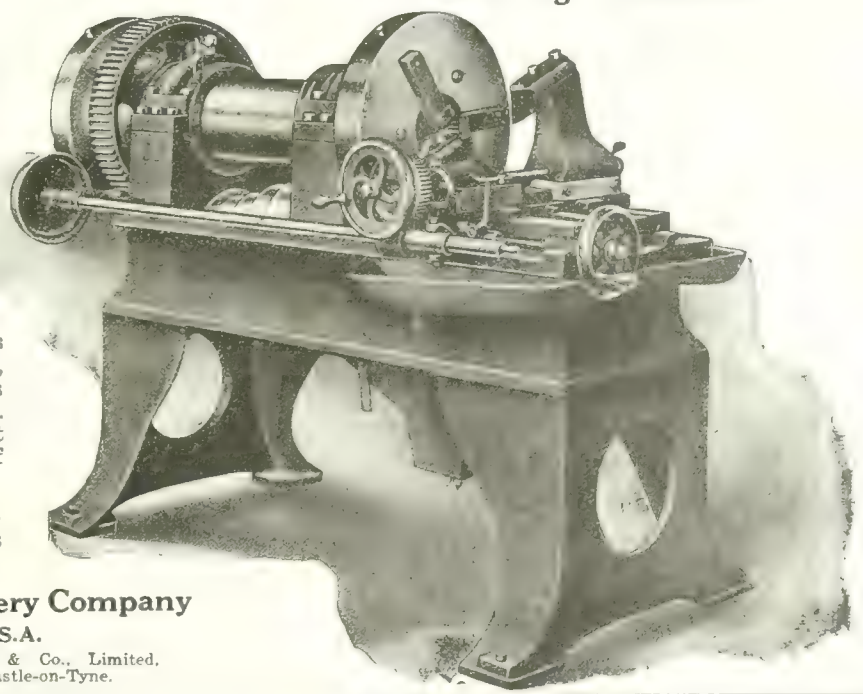
WAYNESBORO, PA.

Cut Your Cutting-off Costs in HALF

HURLBUT'S

Patent Cutting-off and Centering Machines

TO say that the Hurlbut, Rogers Cutting-Off and Centering Machine will **double your production** and **cut your costs in half** may seem like a broad claim. But this is just what this machine will do compared with any ordinary machine of its kind.



Hurlbut, Rogers speed and efficiency is easily explained. Instead of only one, it is equipped with two cutting-off tools —one cutting up and the other down. In this way they hold the work against each other and finish a job in just half the time and do twice the work.

You can't afford to be without this machine. It saves real money. Let us tell you more about it. Write!

The Hurlbut, Rogers Machinery Company

South Sudbury, Mass., U.S.A.

Foreign Agents -England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow and Newcastle-on-Tyne.

A WALL RADIAL DRILL

That Puts Dollars in Your Pockets

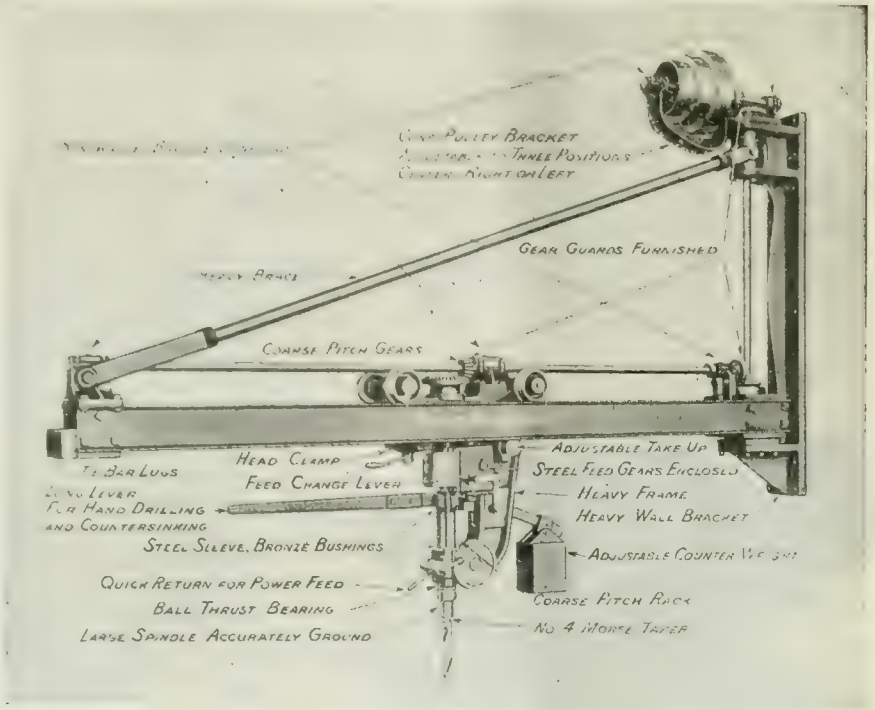
Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this the machine is made of high grade materials throughout, and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling propositions, in your pocket by the installation of this machine.

Send for Detailed Bulletin

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue **BOSTON, MASS.**

HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.

Annual sales over $5,000,000.

Hoyt Metal Co., Toronto

New York, N.Y. London, Eng. St. Louis, Mo.

THE

TRADE K–T MARK

FOUNDRY

GALT - ONT.

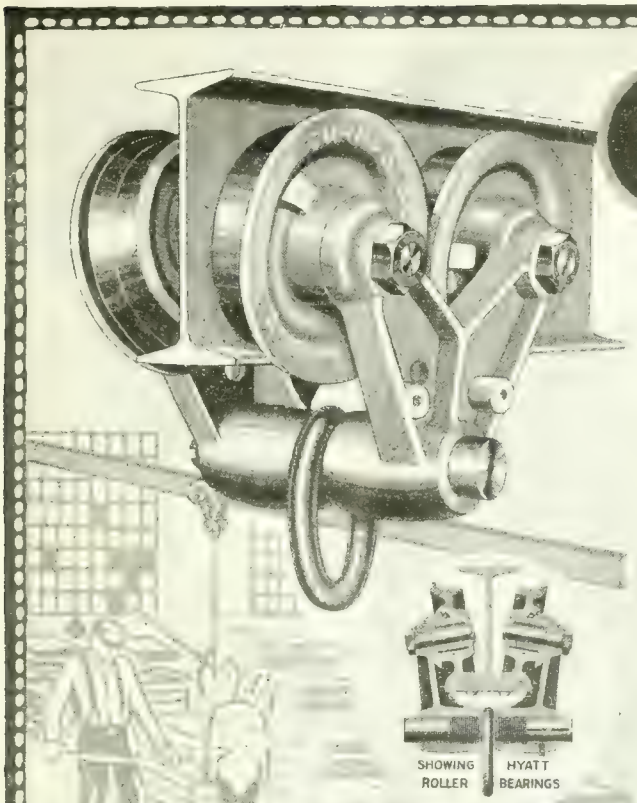
Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. **We can advise you** and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.
We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US



CURTIS
TROLLEYS

Increase Production—Save Man-Power

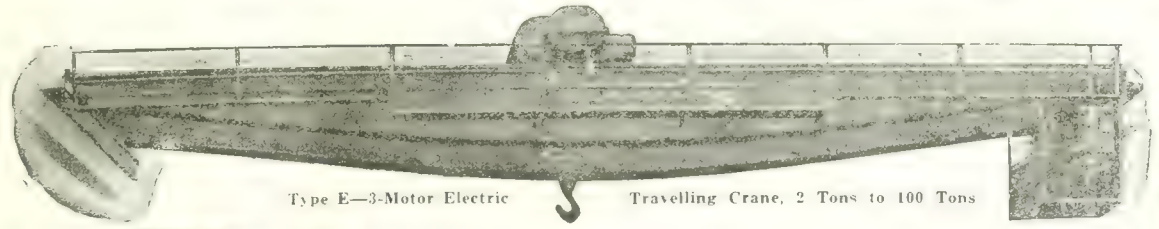
CURTIS Single I-Beam Trolleys are being used by progressive firms demanding the highest operative efficiency. A Curtis Hyatt Roller-Bearing Trolley with a 4000-lb. load can be moved by a 50-lb. pull, while ordinary trolleys require nearly twice as much power to move the same weight.

Curtis Trolleys are constructed with large inclined wheels and self-equalizing steel side-frames—so that each wheel always bears its rightful proportion of the load. They are equipped with shock-absorbing Hyatt flexible Roller Bearings—which make the trolleys easy-starting, easy-rolling and long-lasting. Full information and descriptive literature on request.

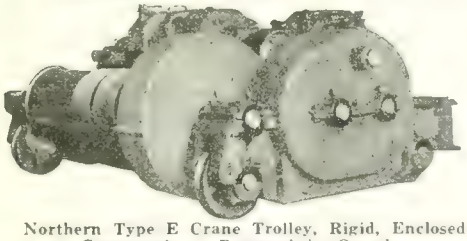
CURTIS PNEUMATIC MACHINERY CO.
1585 Kienlen Avenue St. Louis, U. S. A.
Branch Office
532-A Hudson Terminal, New York City

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

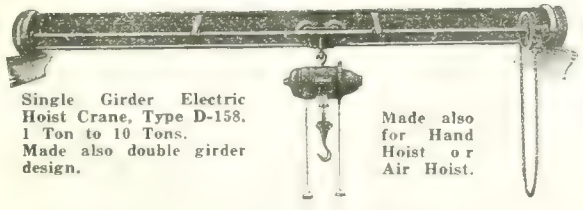


Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



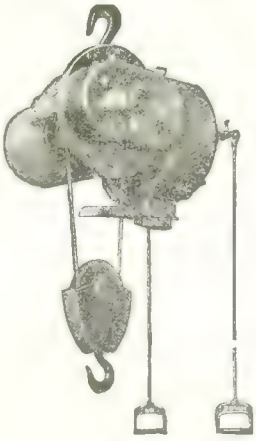
Single Girder Electric Hoist Crane, Type D-158, 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

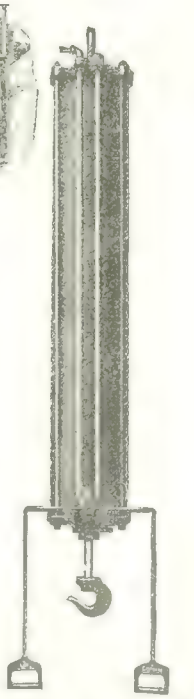
In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.



Type D Electric Hoists —½ to 10 Tons.

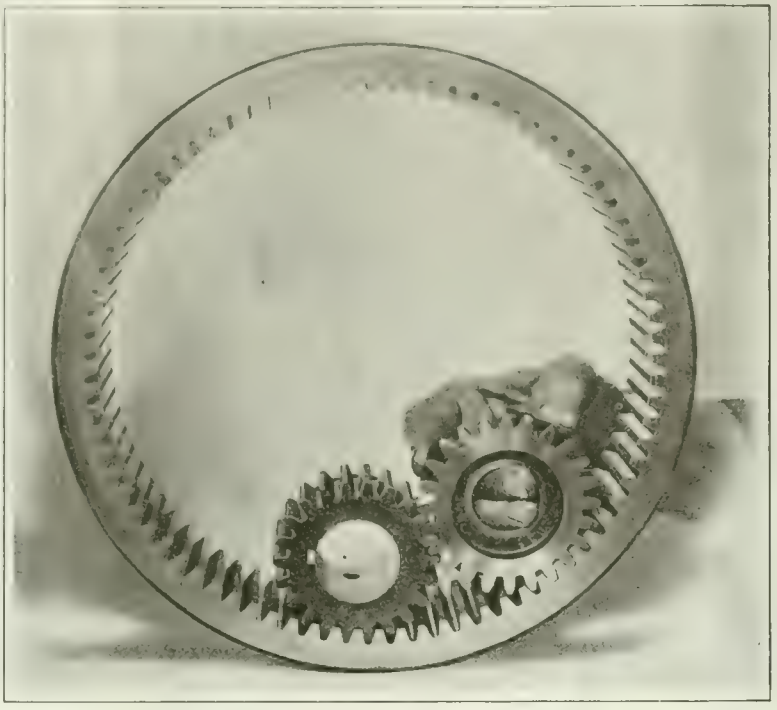
Air Hoists, Trolleys and Tracks.



Type No. 20 Air Hoist.

Northern Crane Works, Limited
Walkerville, Ontario, Canada

The Universal Cutter



Illustrating Universal Application of the Gear Shaper Cutter. Note—Cutter meshes accurately with internal gear and also with pinion, and will generate accurate interchangeable involute gear teeth on each.

The Gear Shaper cutter is acknowledged as being designed on the correct principle for generating involute gear teeth, but the Gear Shaper cutter is more than this. It is a universal cutter; it will cut any form of gear from a 12-tooth pinion to a rack—and either external or internal.

The illustration shows the Gear Shaper cutter in mesh with a pinion and an internal gear. This same Gear Shaper cutter will produce the teeth on both with theoretically correct accuracy.

The Gear Shaper cutter is not limited to the cutting of gear teeth. It is adapted to the generating of other shapes, such as cams, ratchets and other irregular shapes.

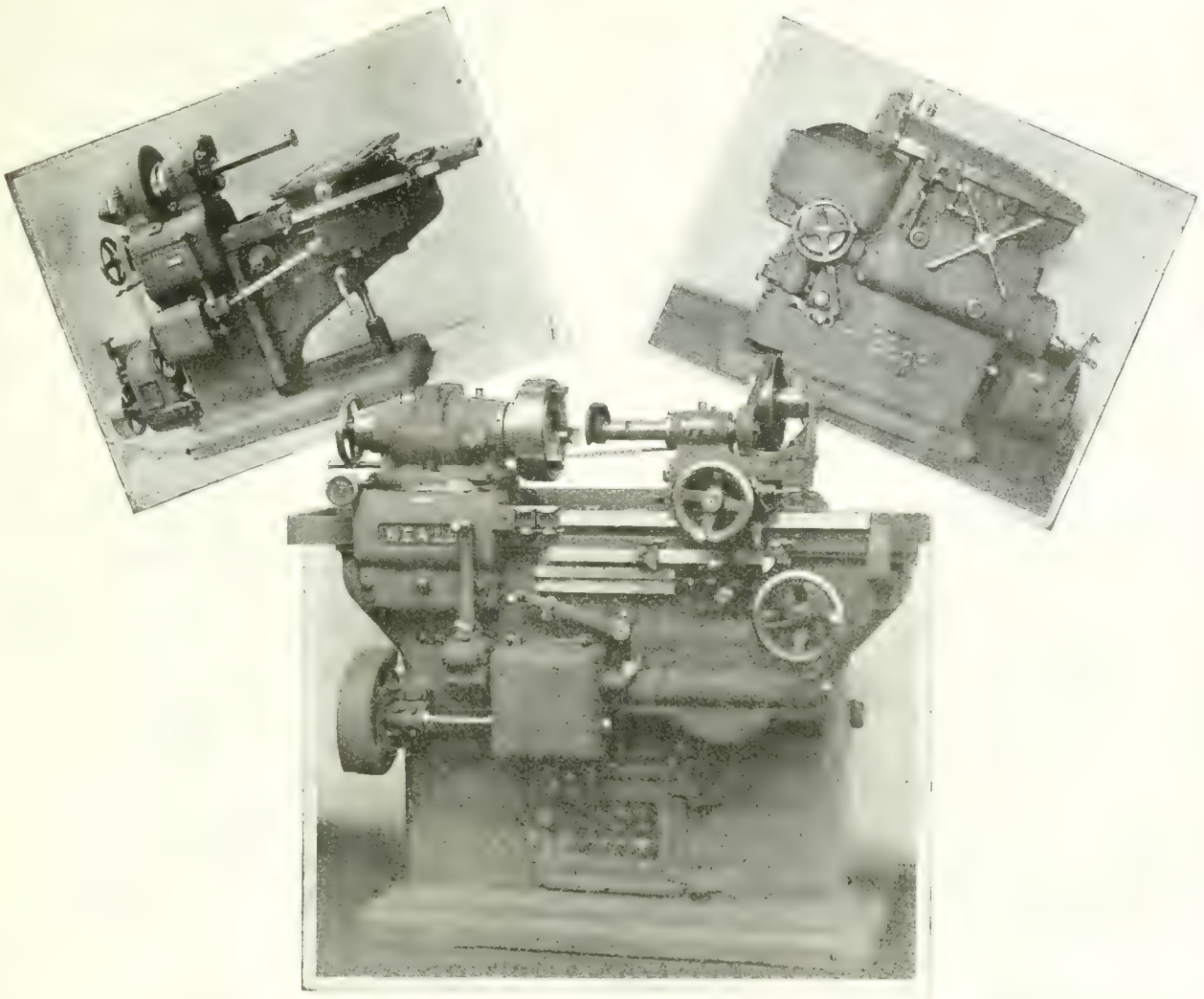
No other gear cutting tool possesses the possibilities of the Gear Shaper cutter from the standpoint of either accuracy of reproduction or low cost of production. Coupled with its many features is a service which has no equal in the gear cutting field. You will need this service more than ever now, because of the great competition that will inevitably come with peace.

Our Engineering Department stands ready to help you with your problems. Their assistance is given gratis. Submit your blueprints for suggestion to

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

Foreign Agents: **Alfred Herbert, Ltd., Coventry, England; Yokohoma, Japan; Calcutta, India; Societe Anonyme Alfred Herbert, Paris, France and Spain; Societa Anonima Italiana Alfred Herbert, Milan, Italy; A. B. Galco, Stockholm, Sweden.**



INTERNAL AND SURFACE GRINDING

If you do surface or internal grinding, one of these three will handle your work to best advantage.

The CYLINDER GRINDER will take care of all work that cannot be rotated to advantage, such as two, four or six cylinders en bloc, and awkward large size castings of any material.

The INTERNAL GRINDER produces absolutely accurate holes, either straight or taper, in hardened steel, iron or bronze. It is ideal on bushings, gears, collars, ball bearing races and a thousand other parts, where accuracy and production are essential.

The SURFACE GRINDER delivers at a commercial rate a mirror finish on keys, rings, cutters, dies, discs, collars; in fact any shaped part whose size is within the capacity of the chuck.

Send for a Complete Folder Catalog

THE HEALD MACHINE COMPANY
Worcester Massachusetts

CARBORUNDUM NIAGARA GRINDERS

JUST TO REMIND YOU THAT YOU CAN SELL THEM

To the Carpenter

For grinding his chisels, plane, bits, gouges, etc. The No. 3 Niagara just suits him. It's big enough for bench work, small enough to pack in his tool kit.

To the Garage Man

For grinding parts, tools and fittings—for a dozen and one jobs about the shop. He will want the big No. 4, or, if he has power, the No. 28 Grinder Head.

To the Farmer

For grinding his scythes, grass hooks, mower sections, feed chopping knives—for edging spades and general farm tools, for grinding household knives, etc., the Niagara No. 14 is the machine for him.

To the Householder

For grinding household knives and tools —a little No. 1 machine.

The business is waiting for you—go after it with Carborundum Niagara Grinders. Carborundum displays and advertising will help you.

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

"One man does the work of eight".....

"We formerly cleaned off the mineral oil from these pumps with gasoline.

"We had to clean them both before and after assembling and it took *eight* men to do it.

"Now we clean them *once* with Oakite and *one* man does as much work as eight men used to do.

"We have eliminated gasoline with its dangers by cleaning with Oakite.

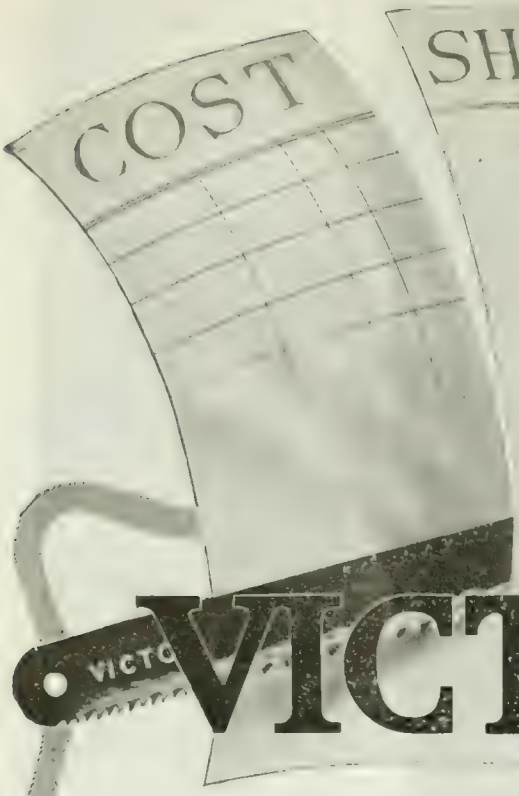
"We have also eliminated the handling of our total product once.

"We save seven men's time and get cleaner work than we ever did before."

This Advertisement is one of a series based on actual occurrences

Correspondence Invited.

OAKITE MANUFACTURED BY OAKLEY CHEMICAL CO. 44 THAMES STREET · NEW YORK



CUT YOUR CUTTING COST WITH VICTOR Flexibles

The high cost of tools should emphasize more than ever the importance of quality.

The high cost of hack saw blades ought to drive every hand blade user over to the saw that does not break in ordinary hand work.

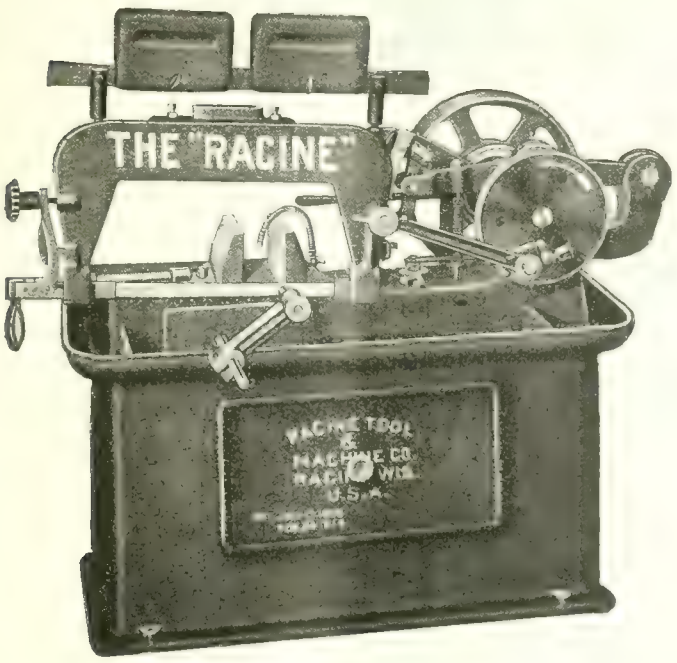
VICTOR FLEXIBLE HACK SAW BLADES have exactly the same cutting power as the finest All-Hard on the market, and that they cannot be broken in use except by intentional abuse is an undisputable fact—which will represent a saving from twenty-five percent to thirty-three and one-third percent in breakage alone.

Seventy-five percent of the All-Hard blades used in hand frames break before they are worn out. Watch the All-Hard blades in your own shop and see the enormous amount of breakage—then use VICTOR FLEXIBLES and note the economy.

VICTOR SAW WORKS LTD - HAMILTON, CANADA

Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

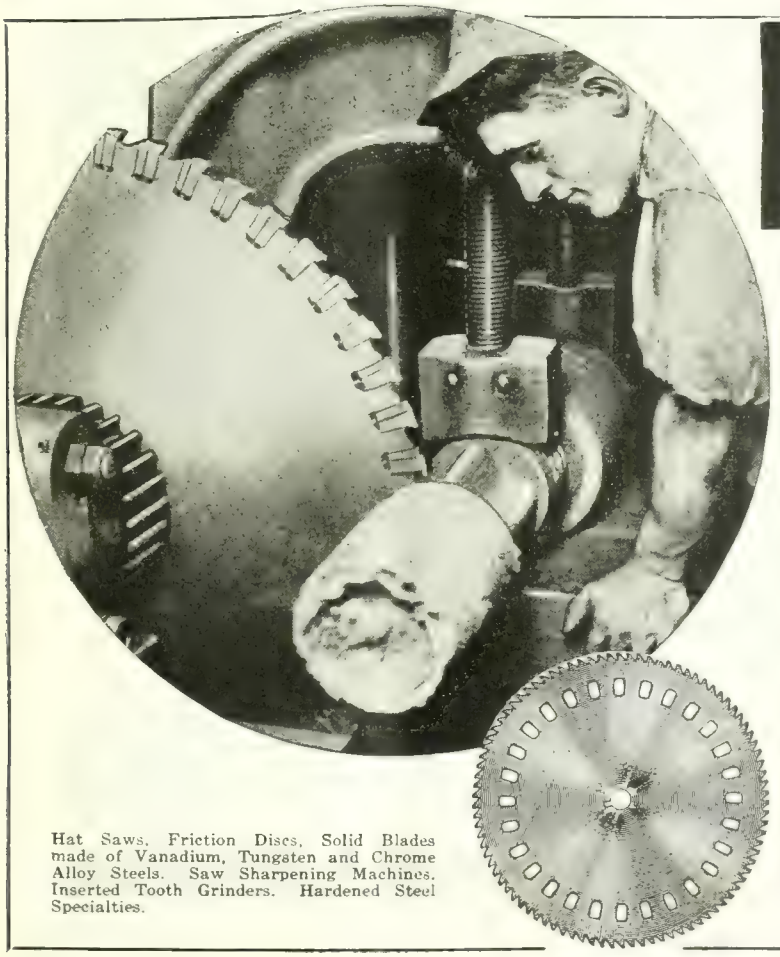
Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue - RACINE, WIS., U.S.A.



Hat Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines. Inserted Tooth Grinders. Hardened Steel Specialties.

HUNTER
Duplex Saws

The selection of many of the best and largest companies in the country for cutting ingots, bars, forgings, castings, rails and structural shapes.

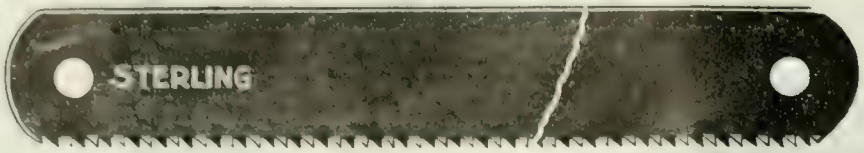
Their fast cutting qualities mean a saving of time and power, plus increased production.

Teeth are accurately formed, ground and set for highest speed and greatest endurance. Made in sizes up to 90 in. in diameter.

Write for price list and full particulars

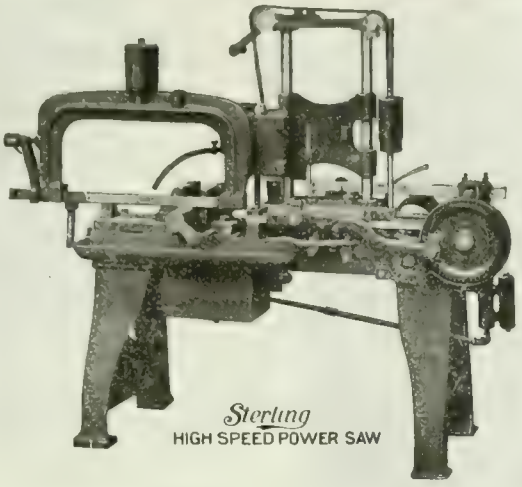
HUNTER SAW & MACHINE CO.
Pittsburgh, Pa.

HACK "STERLING" SAWS



"STERLING" Blades are worth a trial. Tell us or your dealers of your needs.

We can save you money.

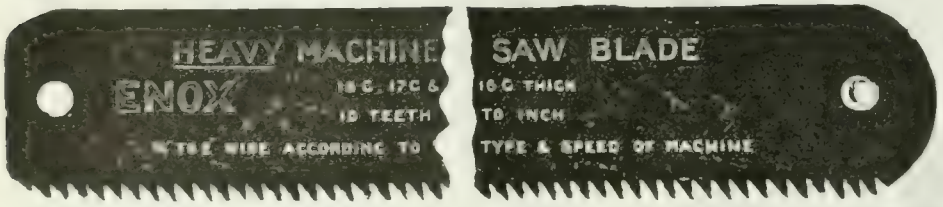


To get the best results from power blades, a good machine is necessary. Try the "STERLING." The combination is excellent.

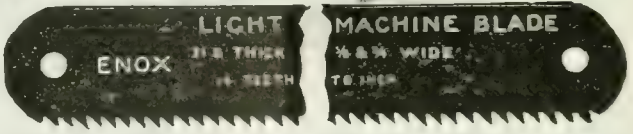
Manufactured by

DIAMOND SAW & STAMPING WORKS, 357 Seventh St., Buffalo, N.Y.

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH
Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER



ENOX
Hacksaw Blades
ARE THE BEST



AGENTS IN CANADIAN TOWNS WANTED

Liberal Terms offered to firms willing to carry stocks and act as sole agents for the district.

Makers:

FRY'S (LONDON) LIMITED

AN ENTIRELY BRITISH COMPANY

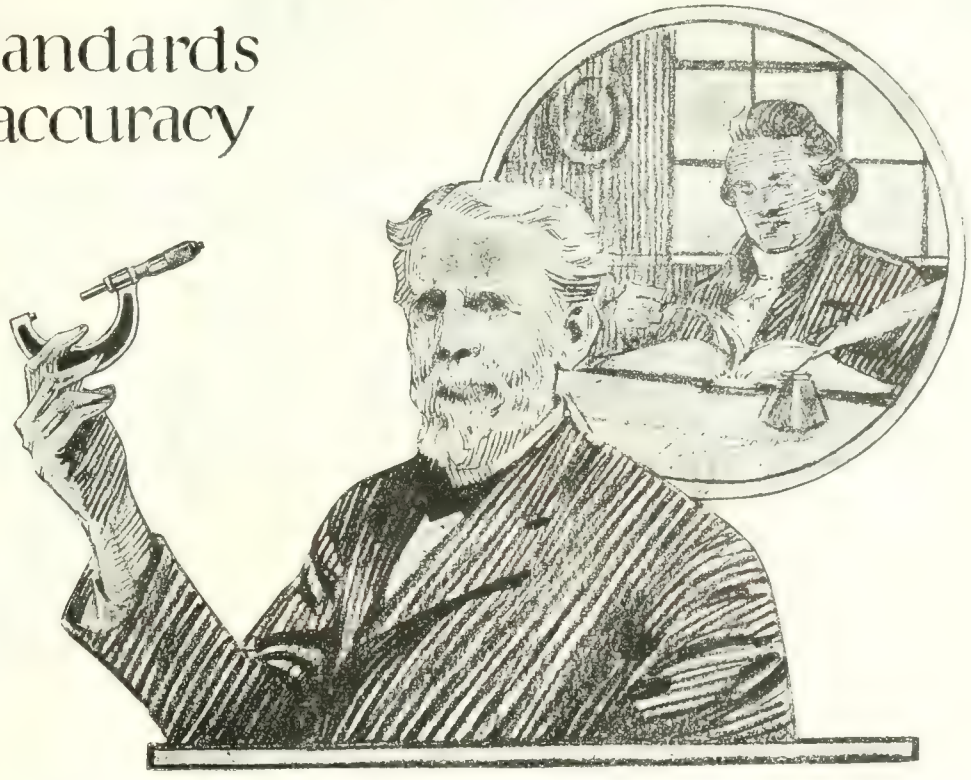
46 Upper Thames St., London, E.C. 4, England. Works Greenwich, S.E. 10

Agents for Canada, East of Fort William

THE STANDARD MACHINERY & SUPPLIES, LIMITED, 261 Notre Dame St. West, MONTREAL, QUE.

Agents for British Columbia—The A. R. Williams Machinery Co., Limited, 495 Railway St., Vancouver, B.C.

Standards of accuracy



Starrett Tools

are made according to the standard set by Noah Webster in 1828, when he defined accuracy—

"In exact or careful conformation to a standard of requirements, the result of care or pains; free from error, failure or defect."

Two generations of machinists have applied that definition to tools that bear the Starrett name—and found it fitted.

Every Starrett Tool is warranted free from error, failure or defect.

Catalog No. 21"3" gives details of the 2100 tools that comprise the Starrett line.

The L. S. Starrett Company

The World's Greatest Toolmakers.
Manufacturers of Hack Saws Unexcelled.

Athol, Mass.

STARRETT HACK SAWS CUT QUICKER LAST LONGER

42-956

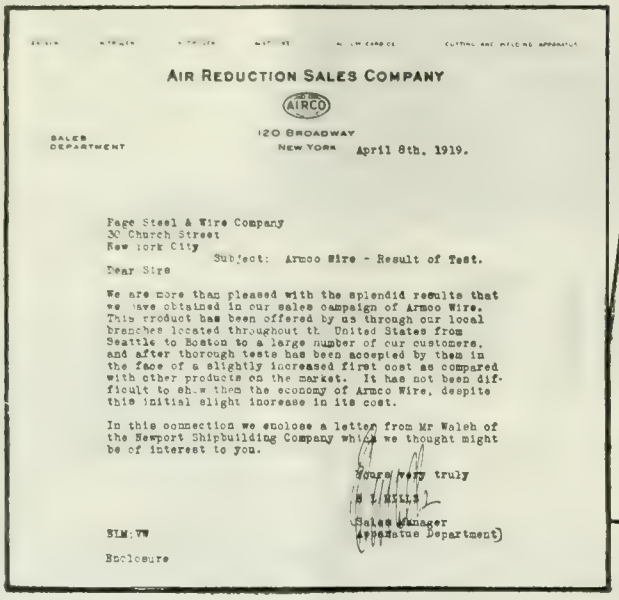
ARMCO IRON WELDING RODS

AMERICAN ARMCO INGOT IRON

The trade mark ARMCO carries the assurance that iron bearing that mark is manufactured by the American Rolling Mill Company with the skill, intelligence and fidelity associated with its products, and hence can be depended upon to possess in the highest degree the merit claimed for it.

cost somewhat more than ordinary filling material, but compared with the total cost of the weld, the difference is insignificant. The difference in strength and safety of the weld, on the other hand, is of vital importance.

"It has not been difficult to show them the economy of Armco Iron Wire—"



AIR REDUCTION SALES COMPANY

AIRCO

120 BROADWAY

SALES DEPARTMENT NEW YORK April 8th. 1919.

Page Steel & Wire Company
30 Church Street
New York City

Subject: Armco Wire - Result of Test.

Dear Sirs

We are more than pleased with the splendid results that we have obtained in our sales campaign of Armco Wire. This product has been offered by us through our local branches located throughout th United States from Seattle to Boston to a large number of our customers, and after thorough tests has been accepted by them in the face of a slightly increased first cost as compared with other products on the market. It has not been difficult to show them the economy of Armco Wire, despite this initial slight increase in its cost.

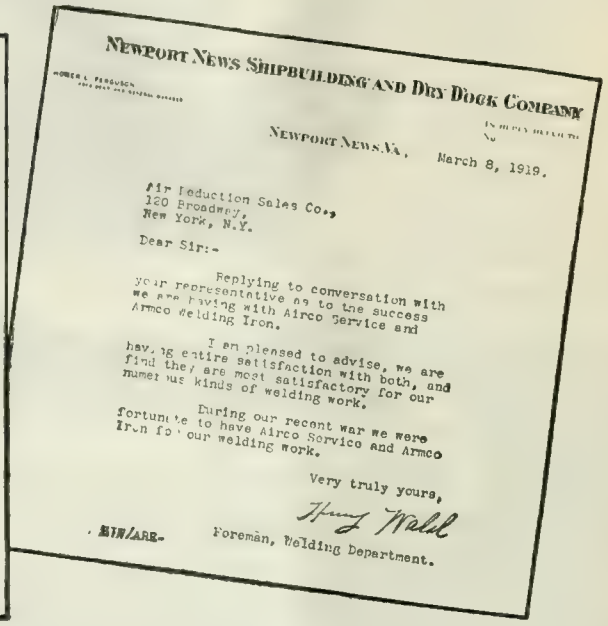
In this connection we enclose a letter from Mr Walsh of the Newport Shipbuilding Company which we thought might be of interest to you.

Yours very truly

(Sales Manager Apparatus Department)

SLM:VW

Enclosure



NEWPORT NEWS SHIPBUILDING AND DRY DOCK COMPANY

NEWPORT NEWS, VA., March 8, 1919.

Air Reduction Sales Co.,
120 Broadway,
New York, N.Y.

Dear Sirs:-

Replying to conversation with your representative as to the success we are having with Airco Service and Armco Welding Iron.

I am pleased to advise, we are having entire satisfaction with both, and find they are most satisfactory for our numerous kinds of welding work.

During our recent war we were fortunate to have Airco Service and Armco Iron for our welding work.

Very truly yours,

Henry Walsh

HW/ARE. Foreman, Welding Department.

The above typical letter to one of our distributors shows that the superiority and real economy of ARMCO welding material are readily appreciated. Welders who use ARMCO IRON exclusively have a big advantage over competitors who buy inferior filler and their customers soon learn the difference.

Another ARMCO advantage from the welder's standpoint is the fact that one kind of rod of guaranteed Armco analysis is specially treated for oxy-acetylene welding and will do all the work (with better results) that heretofore has required a choice of one from many compositions. This means that with a much smaller investment for stock of filling material a shop is fully prepared to handle the usual run of steel and iron welding work.

Because of their exceptional purity and even density Armco Iron Welding Rods flow freely, weld evenly ,and give a joint that lends itself perfectly to hammering, forging, and, where necessary, to annealing and quenching.

Our booklet on "Armco Iron Rods and Wire" is full of interesting and useful welding data. Send for it.

PAGE STEEL & WIRE CO.

STEEL AND WIRE PAGE QUALITY PRODUCTS

Established 1883 as Page Woven Wire Fence Co.

Makers of "Copperweld" Copper Clad Steel Wire; ARMCO Iron Welding Rods and Electrical Wire; Wire Mill Products, Plain and Galvanized; Wire of Special Analysis; Wire Fencing for all Purposes; Factory Gates; Ornamental Iron Fence; Machine Guards; Tool and Stockroom Partitions; Architectural Iron.

Plants: Monessen, Pa., and Adrian, Mich.

STEEL AND WIRE PAGE QUALITY PRODUCTS

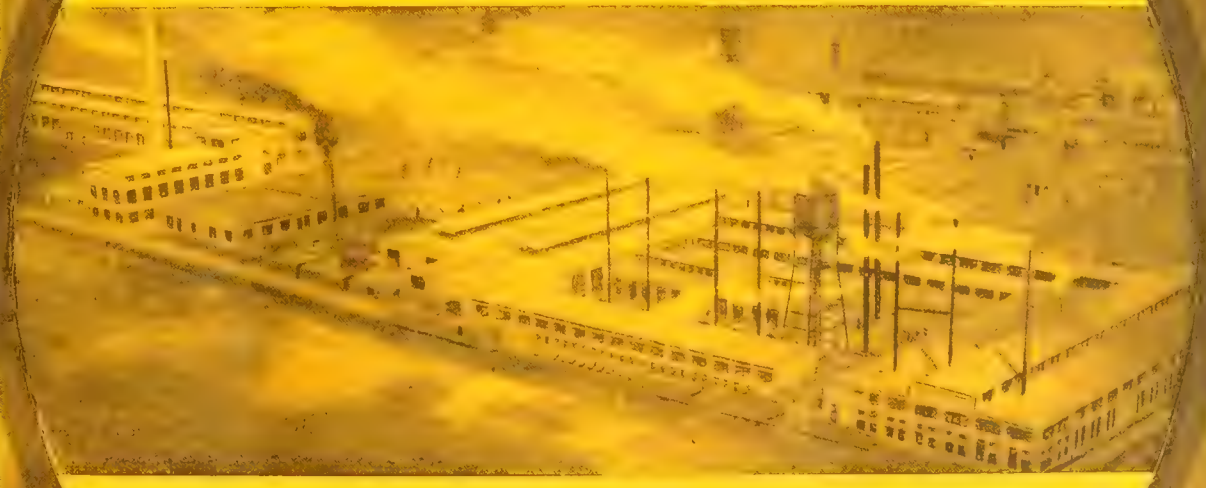
Sales Offices: 30 Church Street, New York

CHICAGO: 29 South La Salle Street
DETROIT: 35-57 Washington Boulevard
SAN FRANCISCO: American Rolling Mill Company, of California
CANADIAN DISTRIBUTORS: Taylor & Arnold, Ltd., Montreal, Toronto, Winnipeg.

BROWN'S

Beaver Brand Metals

Copper, Brass, Bronze, Canada Silver, and Gilding Metal in sheets, rolls, plates and rods. Naval Bronze, Yellow Metal and Muntz Metal in sheets and rods for shipbuilding requirements. Specify Beaver Brass Rod for drilling and free cutting.



Link up with Beaver Brand Products – you'll like the quality, price and service.

Brown's Copper & Brass Rolling Mills, Limited

New Toronto, Ont., Can.

BROWN'S QUALITY

MALLEABLE AND CAST IRON PIPE FITTINGS

M

The Brand That Has The Quality

"Quality" and "Reliability" are two essentials demanded of *Cast Iron* and *Malleable Fittings*, by all sanitary and heating engineers.

Time and money are lost by improperly made fittings. All our cast iron and malleable fittings are properly recessed and every fitting bears the above trade-mark of quality.

We make a complete and full line of both flanged and threaded fittings from ⅛-inch up, and can make deliveries from stock, both standard and extra heavy.

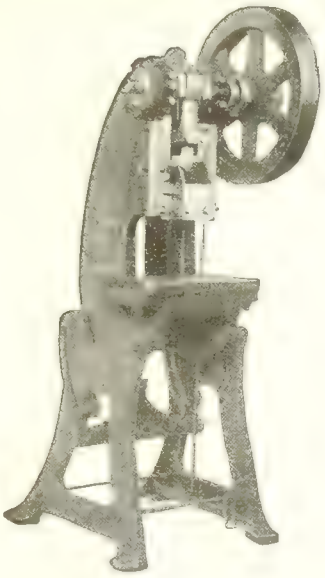
When ordering from your jobber be sure you buy—"the brand that has the quality." They are different. A trial order will convince.

International
Malleable Iron Company, Limited
Guelph, Ontario, Canada

CONSOLIDATED

All the energy of America's most modern machine shop and foundry is concentrated upon one product.

CONSOLIDATED POWER PRESSES



CONSOLIDATED PRESS CO.

HASTINGS - MICHIGAN
U. S. A.

CONSOLIDATED

For trimming, stamping forging, punching, embossing.

Special presses are designed where the customer's requirements are unusual.

CONSOLIDATED POWER PRESSES

Fellow Manufacturers

We Make in Canada

Lead Pipe—Sheet Lead

Wire Solder, Bar Solder, Ribbon Solder.

Babbitt Metal For All Requirements

INGOT METALS

Copper—Tin—Lead
Aluminum and Brass

Everything in Metals

Wherever you are we can serve you.

THE CANADA METAL, CO., LIMITED
Toronto, Montreal, Winnipeg, Vancouver

Swedish Steel & Importing Co., Limited

Montreal Toronto
New York Denver

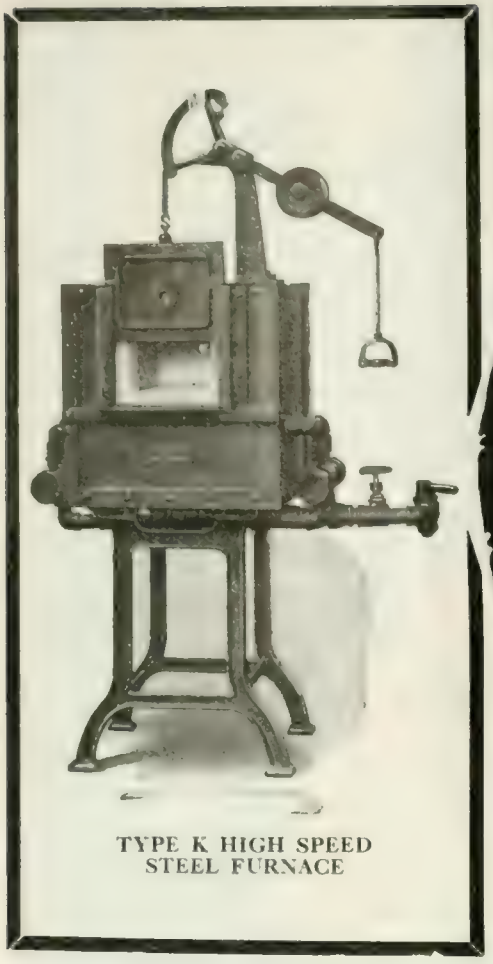
Direct representatives of foremost Swedish mills: makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK
SS

PROMPT SHIPMENTS from large stock



TYPE K HIGH SPEED STEEL FURNACE

The Right Furnace for High Speed Steel

Too much—too little or an uneven heat treatment of High Speed Steel renders it practically worthless for the purpose intended.

This Gilbert & Barker furnace has been designed especially for the correct heat treatment of High Speed Steel. A temperature of 2400°F. is quickly obtained and **easily maintained.** The heat is uniform on all sides of the work and loss by radiation is reduced to the minimum by special insulation.

More than 50 years' experience in designing and building furnaces, especially for the accurate and economical heat treatment of metals is your guarantee of satisfaction.

PROMPT DELIVERY ON G. & B. FURNACES

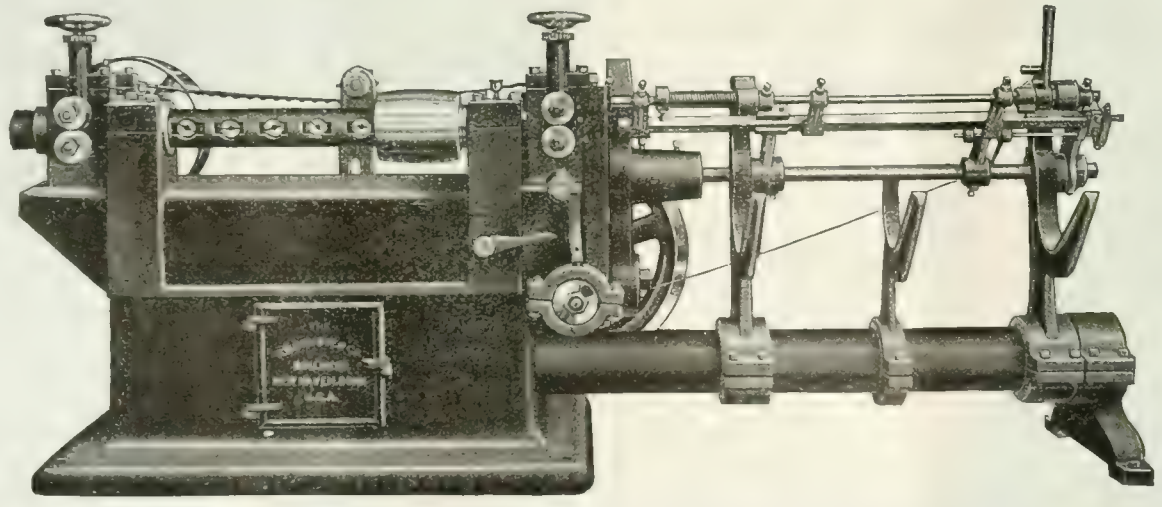
Recent additions to our plant, already one of the largest in this field, makes it possible to offer immediate shipment of your order.

Tell us your problem and we will tell you the type of furnace you require, but first send for Bulletin 24. To-day is a better day than to-morrow--write.

Gilbert & Barker Mfg. Co.

West Springfield, Mass., U.S.A.

Canadian Agents: Williams & Wilson, Montreal, Que. New York Office, 26 Broadway.



Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

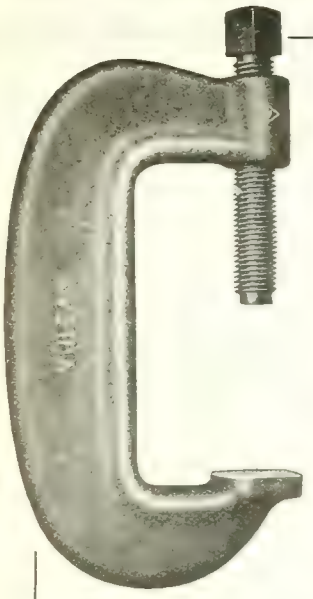
Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.



Williams' Drop-Forged Clamps

CAST Clamps may cost less, but they are not cheaper—first cost is not the only factor to be considered. No cast clamp can, or does stand the constant strain of severe usage.

Williams' Clamps are all drop-forged and are then subjected to a refining heat-process which greatly increases their stiffness and strength. They are thoroughly dependable and render superior service under the hardest and most exacting conditions.

Williams' lines of "C" Machinists' and Strap Clamps provide a wide range of sizes for all clamping service—"There's a Williams' Clamp for every purpose." They are carried by leading dealers and are all fully guaranteed.

A copy of our Machinists' Tools Booklet will be sent on request.

J. H. Williams & Co.

"The Drop-Forging People

45 Richards Street : BROOKLYN, NEW YORK

THE A. G. LOW CO., LTD., 45 Pacific Ave., Saskatoon, Sask. Agents for Manitoba, Saskatchewan, Alberta and British Columbia.

The "Boehm" Positive Opening Threading Die

Hardened and Ground Guides for the Chasers

This Is One Distinct Feature of the

"Boehm"

The "Boehm" Positive Opening Threading Die has a positive opening and closing cam action.

Chasers have the necessary radial movement to enable the die to open after the threading operation has been completed. They are supported by a cam ring throughout their entire length and width. Incidentally—

The chasers slide between hardened and ground guides, and are supported by carriers which have a groove in the outer end for the positive opening cam.

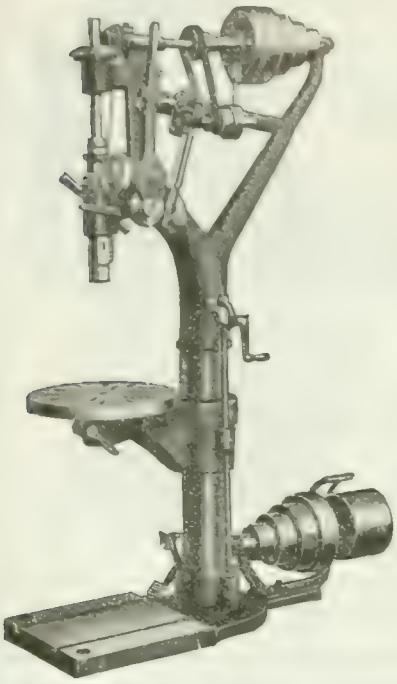
This cam, the locking pins, and the "float" have features that add to the distinctiveness of the "Boehm."

We will be glad to send you complete description.

The Rickert-Shafer Co.

ERIE, PENN.

Silver Drills

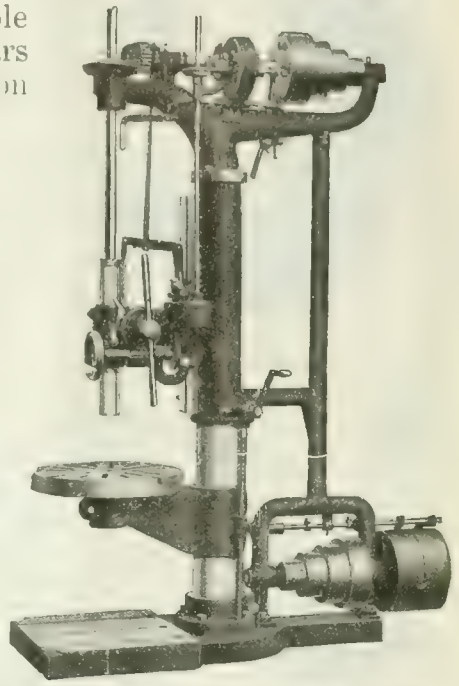


Fast, Strong, Accurate and Dependable drills with an experience of 40 years behind them—they can be depended on to finish the work and do it right.

The 20 is made in four distinct styles with round or square base and can be furnished singly or in gangs of 2, 3 or 4 spindles.

The 25" has eight spindle speeds and six positive geared feeds.

Send for full description and quotations

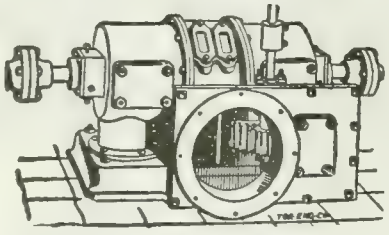


The Silver Mfg. Co.

290 Broadway

SALEM OHIO

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

THE J. C. WILSON MFG. CO.,
LIMITED
BELLEVILLE, ONTARIO

"TALLMANS' SPECIAL" ARCTIC METAL

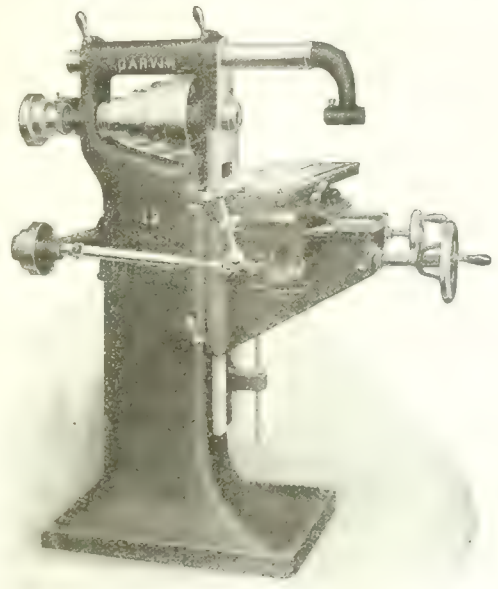
a medium-priced babbitt specially adapted for Saw Mill and Woodworking machinery.

Will remain cool under exceptionally high speed.

Its long life proves its efficiency.

Tallman Brass & Metal Limited
HAMILTON, ONT.

GARVIN



No. 12 Plain Milling Machine-Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments .....18 x 6 x 15 in.

For Further Information ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

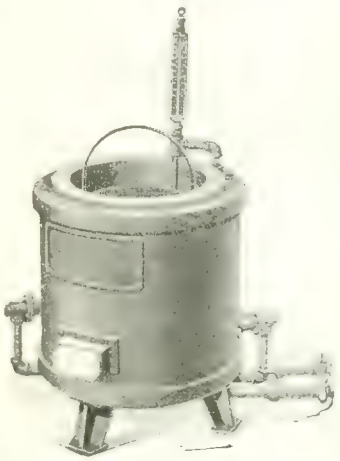
THE GARVIN MACHINE COMPANY

Spring and Varick Streets *(Visitors Welcome)* 50 Years New York City

STANDARD FURNACES

OIL or GAS

Prompt delivery on all tool room types.



Oil Tempering Furnace

For

Annealing
Carbonizing
Hardening
High Speed Steel
Lead and Salt
Oil Tempering
Forging
Riveting

Furnaces built for special requirements

Standard Fuel Engineering Co.

1646 Woodward Ave. Detroit, Michigan

Cool Shop This Summer

if you use

ECONOMIZER FORGE

Showing deflection of hot gases, with induced air toward the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into forge shop.

Write to-day for catalogue 34-T

W. S. ROCKWELL COMPANY

Furnace Engineers and Contractors

50 Church Street, New York

(Hudson Terminal Bldg.)

Canadian Representative: R. J. McLean
128 Bleury St., Montreal, Canada.

THERE IS "A REASON WHY"

When Germany signed the Armistice, Walcott Lathe Company accepted cancellations of orders for Lathes amounting to hundreds of thousands of dollars. Not one cent of damage from the United States Government or anyone else was claimed on account of the cancellation.

YOU SAY, WHY

Because Walcott Lathes are standard equipment throughout. They are built and designed for manufacturing purposes in sizes to meet every requirement of your shop. Thus, we have had a constant increasing demand for Walcott Lathes for the past thirty-eight years, not from one section of the country, but from all over the world. Our business is good, and our plant is running full time, not a man idle.

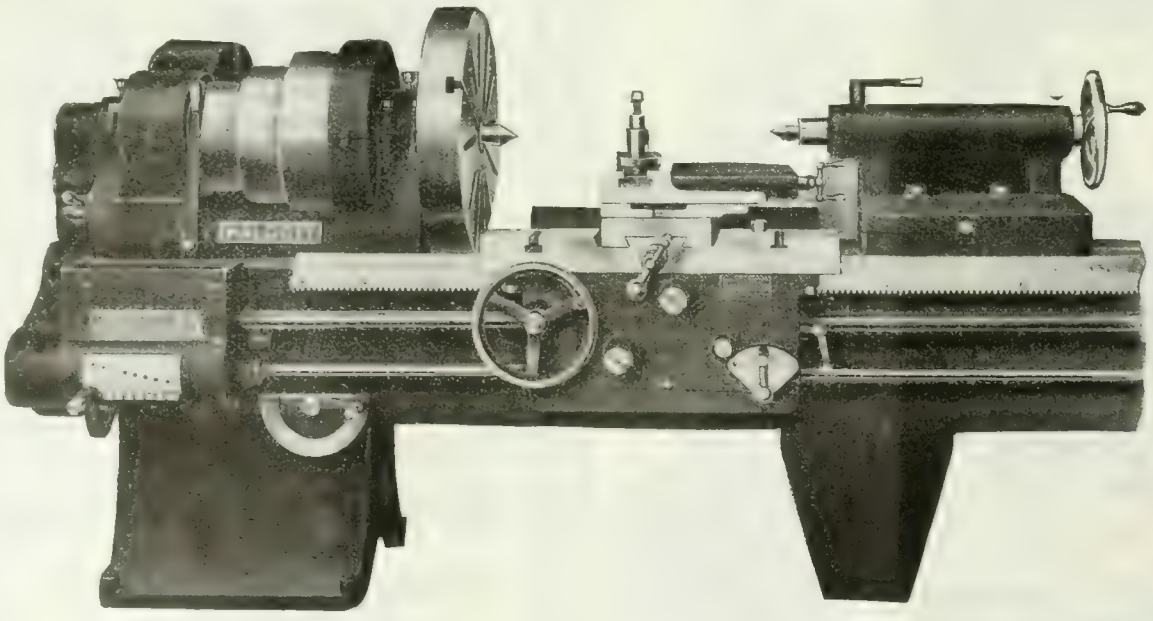
If you are interested in new Lathes, specify the WALCOTT, and you will find by their many advantages "The Reason Why."

WALCOTT LATHE COMPANY

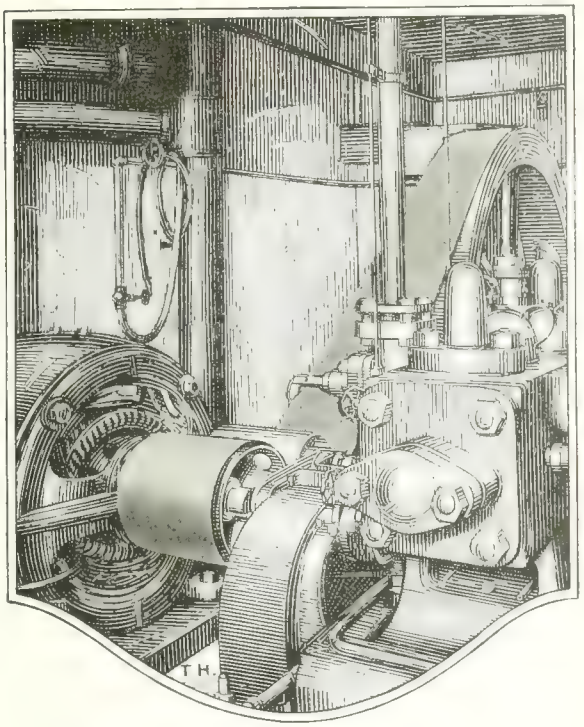
Engine Lathes

140 Calhoun Street - JACKSON, MICHIGAN

AGENTS:—Hill, Clark & Co., Chicago, Ill. Frevert Machinery Co., New York City, N.Y. W. E. Shipley Machy. Co., Philadelphia, Pa. National Supply Co., Toledo, Ohio. Motch & Merryweather Machinery Co., Pittsburgh. H. A. Smith Machinery Co., Syracuse, N.Y. Wm. E. Duff, York, Pa. Wm. E. Duff, Jacksonville, Fla. Brown-McDonald Machy. Co., St. Louis, Mo. Smith-Booth-Usher Co., Los Angeles, Calif. Hendrie-Bolthoff Mfg. Co. & Sup. Co., Denver, Col. Gordon & Finkbeiner, Portland, Ore. Northern Machinery Co., Minneapolis, Minn. Brownell Machinery Co., Providence, R.I. Chas. A. Strelinger Co., Detroit, Mich. Marshall & Huschart Machinery Co., Indianapolis, Ind. Fenwick, Freres & Co., Paris, France. Buck & Hickman, Ltd., London, England. Parke & Lasey Co., Sydney, N.S.W. Standard Machy. & Supplies, Ltd., Montreal, Que. Canadian Fairbanks-Morse Co., Ltd., Toronto, Ont.



Do you know that the centrifugal force in belts at high speed reduces their driving power until at about 9600 R. P. M. a belt is incapable of transmitting power? All such factors are taken into account by our Engineering Department when they design standardized belt drives. Consult them about your problem.



This is a 12-inch Spartan Double Belt, operating a 50 horse-power Gas Compressor. Its cost to date is ½c per horse-power per week. When this belt had been in use 18 months, the engineer wrote us that it had given double the length of service of belts previously used. This has now been in use over four years and is still going strong.

TOP NOTCH

There is another case where top-notch efficiency and economy have been obtained by simply installing the right belt for the work to be done.

For many years Spartan Belting has been dominating the hard drives that destroy other belts. That experience ranks it as top notch in leather, in tannage and in workmanship. It is unusually pliable, wonderfully elastic, it is the greatest of pulley grippers and without an equal for high speed, overload drives or where unfavorable conditions exist.

Spartan well exemplifies the three principles back of Graton & Knight Standardized Series Leather Belt: First, they are made of the right material—leather. Second, they are tanned in our own tannery specifically for belting use, thus assuring the right kind of leather. Third, they are graded into a Standardized Series—a belt for each class of power transmission requirements—standardized in manufacture and standardized for the work to be done.

Certain articles can be tested in a short time—not so belting. It takes years to test out the correctness of principles applied in power transmission. The result of 60 years test of experience is that Graton & Knight Standardized Series Belting, the highest in grade, is also the most widely sold. That is a significant combination: highest quality—largest sale.

Many of the best belted plants ask us to specify the belting for every drive. Try the plan yourself. Then, when buying, call for "Graton & Knight—— Brand or equal." This won't commit you to buying our belts. It will put your buying on the one basic consideration—the work to be done.

Write for book on Standardization as applied to Belting

THE GRATON & KNIGHT MFG. COMPANY, Worcester, Mass., U.S.A

Oak Leather Tanners, Makers of Leather Belting and Leather Products

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Canadian Graton & Knight, Ltd., Montreal. Canadian Representatives: The Canadian Fairbanks-Morse Co., Ltd., St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Vancouver, Windsor, Winnipeg, Victoria.

Graton & Knight
Standardized Series
Leather Belting

Tanned by us for belting use

Note On Grinding

No. 57A

A Book For The Man Who Handles Grinding Wheels

This booklet should be in the hands of every man who handles large quantities of grinding wheels in any manufacturing plant. Sixteen pages of solid reading matter will give him the information he is looking for on

Unpacking Wheels
Tapping Test
Wheel Racks
Storing Wheels
Trucking Large Wheels
Stacking Shape Wheels
Mounting Wheels on Machines
Supervision of Wheel Stock
Perpetual Inventory

In addition to the treatment of the above subjects the booklet contains three pages of diagrams designed to aid the builder of a common-sense wheel rack.

Your written request is all that is necessary to bring you this booklet.

NORTON COMPANY

[illegible] Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

Grinding Wheel Plants, Worcester, Mass.

[illegible] NIAGARA FALLS N.Y. CHIPPAWA ONT. NEW YORK STORE 151 CHAMBERS ST. CHICAGO STORE 111 NO JEFFERSON ST.

NORTON

Forgings, Stampings or Pressed Steel Parts

An attractive catalogue showing the facilities this company has for producing Forgings, Stampings and Pressed Steel Parts—particularly in large quantities—sent on request.

Dominion Forge & Stamping Co., Ltd.
WALKERVILLE, ONTARIO
Toronto Office: 206 Excelsior Life Bldg.

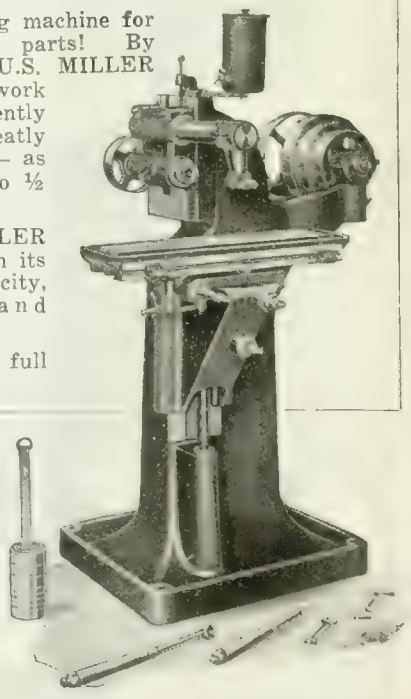
U.S. MILLER

Reduce Your Milling Costs ⅓ to ½

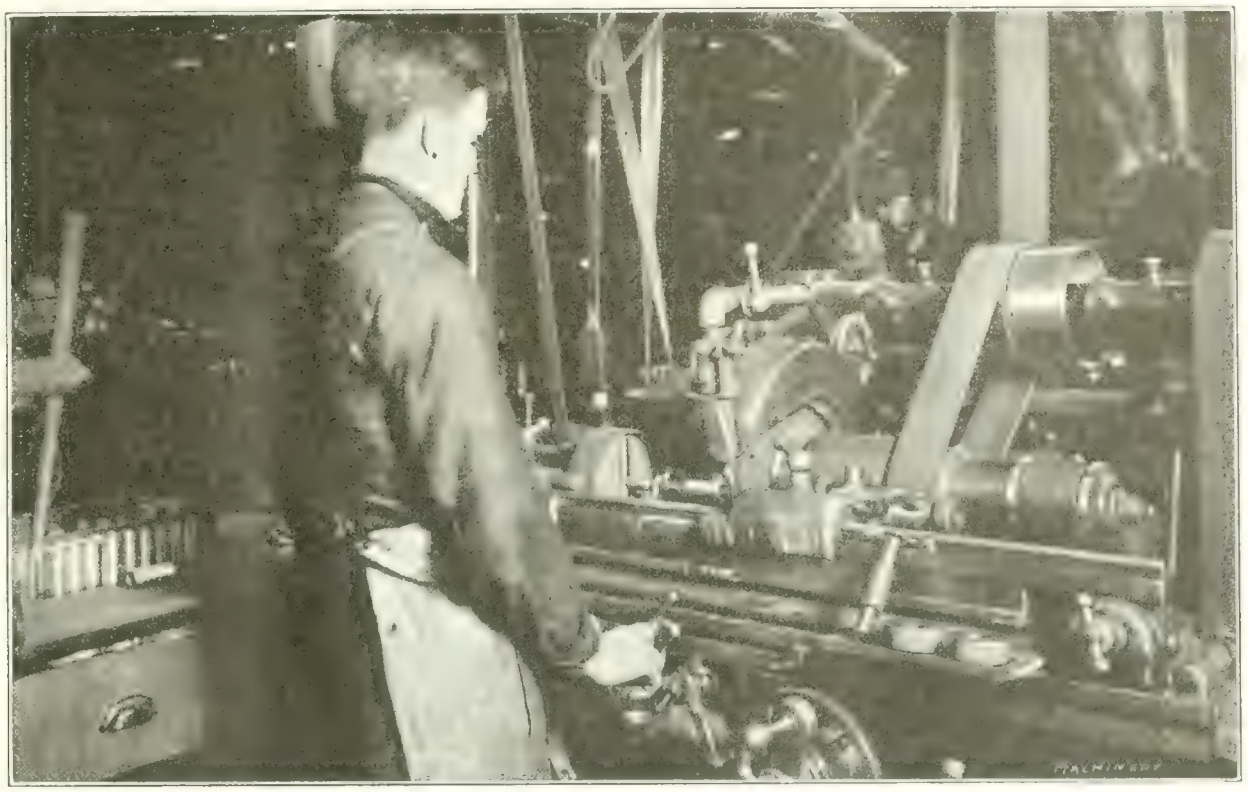
Don't use a big machine for milling small parts! By adopting the U.S. MILLER you can do the work just as efficiently and at a greatly reduced cost — as much as 1/3 to ½ lower.

The U.S. MILLER stands alone in its class for capacity, accuracy and speed.

Write for the full details.



United States Machine Tool Co.
CINCINNATI
Ohio U.S.A.



Every Hour He Grinds 50 Tapered Bushings

Compare this output with the best performance possible on a lathe. The limit is half-a-thousandth and the operator turns out 450 cast iron bushings in a 9-hour day.

NORTON

This machine is only one of 13 Norton Grinding Machines in the King Sewing Machine Company's plant at Buffalo. The material is cast iron, size 1 22 in. long and 1½ in. dia., tapered 0.00005 in.

From .008 in. to .010 in. of stock must be removed so you will realize that modern Norton Grinding is not the old style polishing operation. The operator uses two arbors and two dogs so that the machine stops only long enough to take out the work and start up again.

The work comes from the lathe immediately after the roughest kind of a roughing-out job so that the Norton saves the time necessary for a finishing lathe cut.

We'll be glad to tell you more about the elimination of the finishing lathe cut. Write us to-day.

Norton Grinding Company, Worcester, Massachusetts

Chicago Store: 11 North Jefferson Street

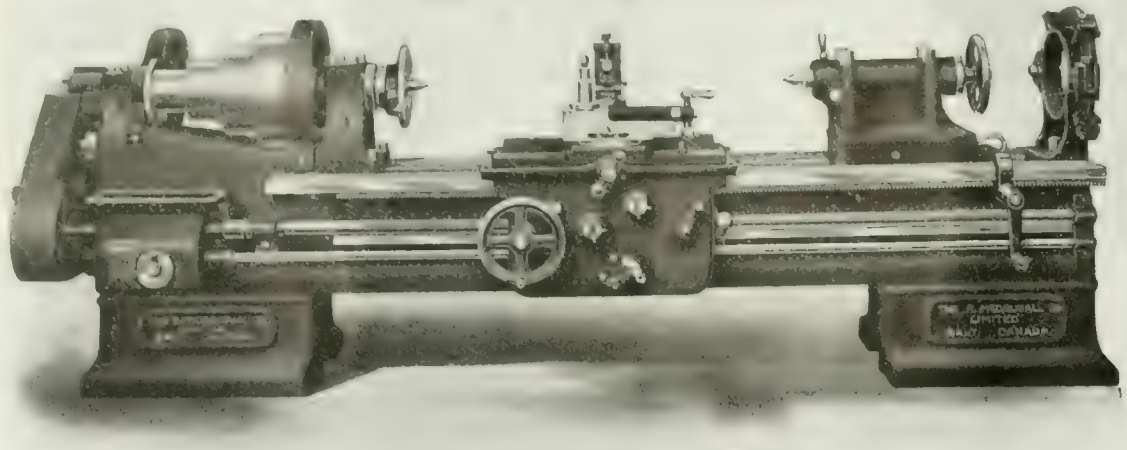
Vonnegut Machinery Company, Indianapolis, Ind. **Robinson, Cary & Sands Company,** St. Paul and Duluth, Minn. **Manning, Maxwell & Moore, Inc.,** St. Louis, Mo. **Henry Prentiss Co.,** New York, N.Y.; Boston, Mass.; Buffalo, N.Y.; Rochester, N.Y.; Syracuse, N.Y.; Scranton, Penna. **The Motch & Merryweather Machinery Company,** Cleveland, O.; Detroit, Mich.; Pittsburgh, Penna.; Cincinnati, O. **Eccles & Smith Company,** San Francisco, Calif.; Los Angeles, Calif.; Portland, Ore. **The Canadian Fairbanks-Morse Company, Ltd.,** Montreal, Que.; Toronto, Ont.; Vancouver, B.C. **C. T. Patterson Company, Ltd.,** New Orleans, La. **Kemp Machinery Company,** Baltimore, Md. **W. E. Shipley Machinery Company,** Philadelphia, Penna. **Alfred Herbert, Ltd.,** Coventry, Eng.; Paris, France; Milan, Italy. **Post Van der Burg and Company,** Rotterdam, Holland. **The F. W. Horne Company,** Tokio, Japan. **Iznoss-koff & Co.,** Petrograd, Moscow and Ekaterinburg. Nor-

ARE-MAC-DEE IS A GUARANTEE

Every part of our Gap Lathes bears the "earmarks" of expert workmanship.

McDOUGALL GAP LATHES

And every feature is proof of our aim to produce a machine of unusual merit.



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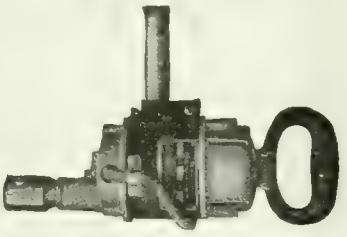

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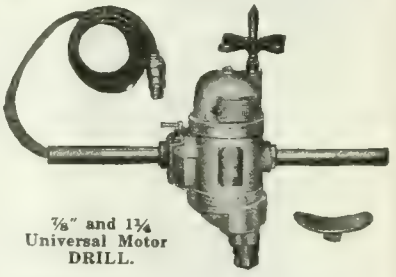

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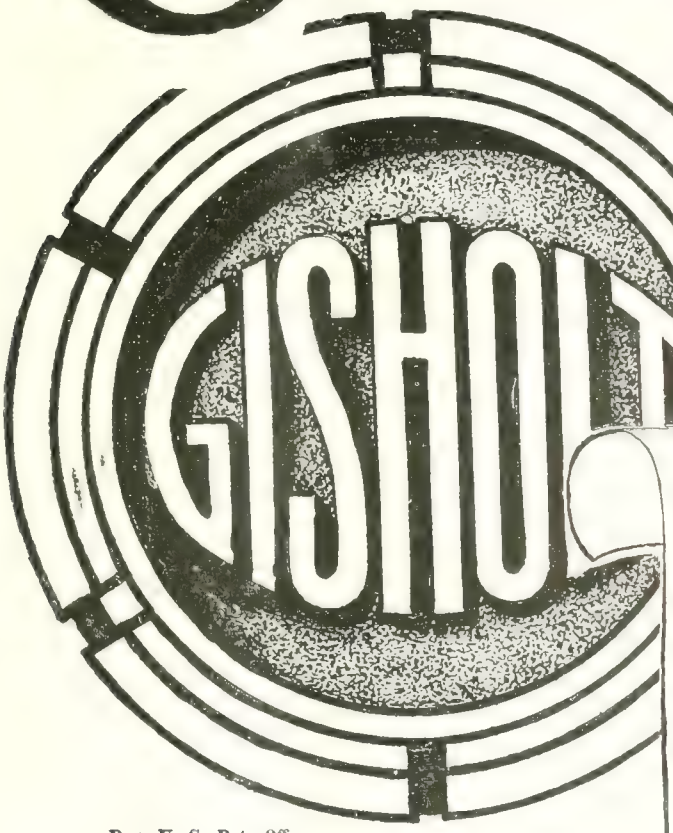

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Machinery Stock List

LATHES

[illegible] x 8 Rivett Engine Lathe, with quick change [illegible] standard equipment
[illegible] x 8 Engine Lathe with quick change gears, [illegible] compound rest and full standard equipment
[illegible] x 8 Engine Lathe with quick change gears and [illegible] compound rest and full standard equipment
[illegible] x 8 Sebastian Lathe with single back gears, plain [illegible] and full standard equipment
[illegible] x 8 New Haven Lathe taking 30 feet between [illegible] equipped with adjustable face [illegible] and full equipment
[illegible] x 8 Sebastian Lathe, with oil pan bed, plain [illegible] full standard equipment
[illegible] x 8 Rivett Wheeler Geared Head Lathe with quick change [illegible] and full standard equipment
[illegible] x 8 Sebastian Lathe with taper attachment, quick change [illegible] compound rest and full equipment
[illegible] x 8 McDougall Engine Lathe with quick change gears, [illegible] compound rest and full standard equipment
[illegible] x 8 McDougall Engine Lathe, ditto, with same equipment
[illegible] x 10 McDougall Engine Lathe, with double back gears, quick change gears, compound rest, steady rest and full standard equipment
[illegible] x 10 McDougall Gap, with double back gears, quick change gears, compound rest and full standard equipment
[illegible] x 12 McDougall DBG and QCG Engine Lathe
18 x 8 Gendron Kuhlman DBG and Semi QC Engine Lathe
[illegible] x 8 Rue DBG and QCG Engine Lathe
[illegible] x 6 Leonard ditto (used)
Greenfield No. 207 Speed Lathe, 4' bed.
Greenfield No. 140 Hand Screw Machine.
Dingee 9 x 30 4-Step Cone Bench Lathe, with C S
Perfect 12 x 8 Gap Lathe
14 Modern Taper Attachment

SHAPERS

[illegible] "Waterous" Back Geared Shapers, with vise, countershaft, etc
[illegible] "Waterous" Back Geared Shapers with vise, countershaft, etc.
2 McDougall Back Geared Shapers, with vise, countershaft, etc.
2 McDougall Back Geared Shapers with vise, countershaft, etc.
1 Smith and Mills 28" Back Geared Shapers, single pulley drive.
1 McDougall 14 Back Geared Shaper (power down feed)
McDougall 20 ditto, plain
McDougall 20 ditto, plain
1 Worcester 20 ditto.

GRINDERS

No. 6 Perfect Grinders, complete, Cap 12 x 2" wheels.
No. 8 Perfect Grinders complete, Cap. 18 x 3" wheels.
1 No. 2 Blount Grinder complete 10" x 1½" wheels.
No. 1 Norton Universal Tool and Cutter Grinders.
No. 2 Brown and Sharpe Cutter and Reamer Grinder
No. 00 Brown and Sharpe Surface Grinder.
1 No. 1 Brown and Sharpe Universal Grinder.
1 No. 1A Wells Drill Grinder, complete.
Gisholt Universal Tool Grinders complete.
1 No. 4 Perfect Grinder Heads.
No. 10 Perfect Grinder Heads.
1 No. 10 Perfect Combo Grinder and Buffer
1 No. 2 Blount Grinder complete, 8" x 1½" wheels.
1 No. 2 Blount Grinder and Buffing Machine.
1 -Type O.A. Worcester Drill Grinder complete.
Gisholt Universal Tool and Cutter Grinders, regular equipment.
1 Stevens Universal Tool and Cutters.
1 Murchey Chaser and Disc Grinder (used).
Gardner No. 4 Disc Grinder.
1 Perfect Disc Grinder.
1 -Greenfield No. 1A Drill Grinder.
2 Perfect No. 5 Grinder Heads with C S
1 Perfect No. 5 Head and C S, with adj. guards.
Perfect No. 6 Grinders, with adj. guards.
1 Perfect No. 8 Grinder, 18 x 3 wheels, with adjustable guards.
1 -Perfect No. 6 Grinder Head.
Perfect No. 8 ditto.
1 Barnes Bench Grinders, with groove pulley and 2 4 x ½ wheels.

ELECTRIC GRINDERS

1 Dumore Electric Grinders, 110 V., Type 2A C., 1/6 H.P.
1 -Dumore Universal Grinder, 110 V., No. 1, ⅛ H.P.
1 Type J, 110 V., D.C., U.S. ½ H.P., Parallel Grinder (used).
1 Type J H.A., 110 V., A.C., U.S. ½ H.P., Parallel Grinder (used).
1 Dumore Electric Grinders, 110 V., Type 2 A.C., 1/6 H.P.

DRILL PRESSES

1 -5 16" McKenzie Column Drill.
1 -5 16" McKenzie Sensitive Bench Drill.
2 -14 Perfect Column Drills, No. 1 M.T.
2 -1" Perfect Bench Drills, No. 1 M.T.
1 -16 Perfect Column Drill, No. 1 M.T.
1 -17 Perfect Bench Drills, No. 1 M.T.
2 -18 Perfect Bench Drills, No. 1 M.T.
1 -Model L-1, Cap ⅜", H.S. Detroit Sensitive Ball Bearing Drill.
20 McDougal, Back Geared Drills, No. 3 M.T.
1 -16 Hoefer Column No. 2 M.T.
1 Model L., Cap ⅜", H.S. Detroit Sensitive Ball Bearing.
1 -21" Hoefer Vertical Drill, No. 2 M.T.
1 -No. 65 6-ft. Moline Multiple Spindle Drill.

ELECTRIC DRILLS

1 -Type A.U., Cap. 3-16", 110 V., "Universal" U. S. Elec. Drills.
Type B.U., Cap ¼, 110 V., "Universal" U. S. Elec. Drills.
1 Type C.U., Cap ⅜", 110 V., "Universal" U. S. Elec. Drills.
1 -Type D.U., Cap. ½, 110 V., "Universal" U. S. Elec. Drills.
1 -Type E.U., Cap ⅞, 110 V., "Universal" U. S. Elec. Drills.
1 Type [illegible] U., Cap [illegible], 110 V., "Universal" Standard Elec. Drills.
2 Type S.U., Cap ¼, 110 V., "Universal" Standard Elec. Drills.
1 Type S.U., Cap ½, 110 V., "Universal" Standard Elec. Drills.
2 Type C B, Cap ⅜, 110 V., D.C. (used) U. S. Drill.
1 Type C B, Cap ⅜, 220 V., D.C. (used) U. S. Drill.
1 Type 6-U, Cap ¾, 110 V., Universal Standard Drills.
1 Type 10-U, Cap 1¼, 110 V., Universal Standard Drills.

DRILLS

1 No. 3 McDougall 20" Back Geared Drills.
1 Natco 20 Spindle No. 37 Drill (used).
1 Henry and Wright Class "K" 12" Overhand Drill.
Perfect No. 16 Drill.
1 Avey No. [illegible] H.S. Bench Drill.
2 Reed 4 Spindle Drill 7" Overhang Slide Table, 32" x 12" (used).
1 Prentice 8 Spindle 6½ Overhand Slide Table, 26' x 12" (used).

POWER HACK SAWS

2 6" x 6" West Haven Acme Power Hack Saw.
6 No. 0 6" x 6" Perfect Power Hack Saws.
2 No. 3 6" x 6" Perfect Power Hack Saws.
1 No. 2 [illegible] x 5" Perfect Power Hack Saw.
2 No. 0 6" Perfect Power Hack Saws.
2 No. 0 6" x 6" Perfect Power Hack Saws.

HACK SAWS

1 Acme 7 x 7" High Speed Hack Saw.
2 Peerless 6" x 8" High Speed Hack Saw.
2 Perfect No. 3 6" x 6" High Speed Hack Saw.
6 Racine No. 1 6" x 6" High Speed Hack Saws.

MILLING MACHINES

1 No. 0 Brown and Sharpe Plain Milling Machine with pump.
1 Kempsmith No. 3 Universal Millers.
1 13½" Kempsmith Universal Dividing Head.
1 10½" Kempsmith Universal Dividing Head.
1 Garvin No. 21 Plain Miller (used).
2 -Burke No. 1 Bench Millers.

BORING MILLS

1 Fosdick No. 0 Horizontal Boring, Drilling and Milling Machines.

PIPE CUTTING MACHINES

1 No. 1 McDougall Pipe Machine, cuts pipe ¼" to 2" inclusive, with quick opening, adjustable dies, and standard equipment.
1 No. 2 McDougall ditto, Cap. 1" to 4".
1 -No. 3 McDougall ditto, Cap. 1½" to 6".

CUTTING OFF AND FACING MACHINE

1 -6" Facer Victoria.
1 Hall 6" Cutting Off Machine.
1 -Hall 4.5" ditto (used).

CUTTING OFF MACHINE

1 No. 6 Nutter and Barnes Automatic Metal Cutting-off Machine, capacity round stock 5¼", square stock 5¼"; I Beams 8"; 1" Rods, 13 pieces; 1½" Rods, 13 pieces; with regular equipment.

PRESSES

1 -Brown Boggs No. 200 Plain Press, inclinable.
1- Brown Boggs No. 2½ O.A. Press (used).
1 -Brown Boggs No. 150 Plain Press, inclinable.
1 Perrin 120-ton Hydraulic Press, 12" (used).
1 Ditto 75-ton, 10" (used).

FURNACES

1 -Mecol 45" Nosing Furnace.
1 Hoskins G, 32" Furnace.

WOODWORKING MACHINERY

1 -78 Cowan Foot Lathe Mitre Machine.
1 212 Jackson Cochrane Chair Seat Fitter.
1 Jackson Cochrane Two Drum Sander.
1 38" Crescent Band Saw, with guards.
1 No. 8 Morgan Nailing Machine (used).
1 No. 3 American Mortiser, Belt Driven.

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1 No. 140 "Wells" Hand Screw Machine, turns 5" length, swing over ways 11", diameter of hole in spindle 1⅛", maximum capacity of push-out collet ⅞", diameter of Turret holes 1", with regular equipment.

ELECTRIC SCREW DRIVER

1—Type V.S.U., 110 V., Electric Screw Driver (used).

ELECTRIC TOOLS

5 Dumore Grinders, style "A" attach., 110 volt.
1 -Do., Do., "B" attachment.
1 -U.S. Elec. Tool Co.'s Type G.U. 1¼" Drill.
1 -U.S. Elec. Tool Co.'s Type E.U. ⅞" Drill.
1 -U.S. Elec. Tool Co.'s Type D.U. ½" Drill.
1 -U.S. Elec. Tool Co.'s C.U. ⅜" Drill.
1 -U.S. Elec. Tool Co.'s Type B.U. ¼" Drill.
1 Black & Decker Type "C" 110 volt, ⅜" Drill
1 Black & Decker Type "D", 110 volt, ½" Drill.
1 Dumore Type 1, A.D. 3/16" Drill.

BOLT CUTTERS.

1 Landis 1½" Single Head Bolt Cutter Style "F" with holders, pump, countershaft and wrench equipment.
1—2" Landis Bolt Cutter Head.

PUNCHES AND SHEARS.

1 No. 150 Brown and Boggs Inclinable Open Back Presses, Cap 1½" hole x 16 gauge steel with fly wheel.

BALERS.

1—Camoo 18" x 18" x 14" Paper Baler.
1 " 30" x 15" x 28" Paper Baler.

MISCELLANEOUS.

1—Rickert Shafer Tapper, ¼" Vertical Type.
1—Dinge No. X Separator, 110 volt, D.C., Elec. Magnet (used).
1—Berkshire Manufg. Co.'s Moulding Machine (used).
1 Horizontal Tapping Machine, small (used).
1 St. Louis Tapping Chuck
2—Four Sides Tool Posts for 20" Cincinnati Lathe.
4—Compound Rests for 20" Cincinnati Lathe.
1 High Speed No. 4A Hamer 4.5 Shells.

The Canadian Fairbanks-Morse Co., Limited

Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

CANADIAN MACHINERY AND MANUFACTURING NEWS

Volume XXII. No. 6 Toronto, August 7, 1919

Building 5-inch Gun Mounts at Brantford

In Our July 24th Issue We Published the First Portion of This Article—Further Operations Are Now Described, Until the Mount is Finally Completed and Inspected.

By J. H. MOORE, Associate Editor Canadian Machinery

Before going into the details of the second portion of this article, let us summarize just what parts we have touched on. As will be remembered, we touched on the operations on the stand, training ring, carriage, and slide, finishing up at this portion. So now, since we have reviewed up to this point, let us go still further into the remaining portions of this mount. To allow readers to familiarize themselves with the technical names of some of the important parts, let us refer to Fig. 1, and note what the various letters shown on this photo illustrate.

A is a large steel casting technically termed "The Yoke." B is termed the telescope holder. C the elevating and depression hand-wheels. D is what is termed the sight bar head, while E is where the support bolt of recoil cylinder comes through. F and G are the support bolt holes for the recoil spring cylinder bolts. H illustrates one of the two recoil spring cylinders. I represents the elevating bracket casting. We will now leave this photo for the present, but will refer to it later in the article.

FIG. 1.—GENERAL VIEW OF THE GUN AND MOUNT.

The Yoke

The yoke is a very long and slender steel casting. The natural result is a casting very springy, and usually warped, so that the first operation on these parts is that of a straightening process.

To do this they are placed on a large frame of the shape that the yoke should be, when the parts which are warped are played on by an oil burner, when after being heated at these portions they are pulled down to the form by means of clamps, and allowed to cool. The work is then taken to the layout table, and marked off correctly. They are now roughed off on the shaper and planer, then drilled, but these operations are of the usual style. They are later taken to a converted planer, which has been turned into a vertical milling machine, and there various milling operations are performed. Another milling operation worthy of note is shown at Fig. 2. In this operation, the portion where the azimuth rack (as it is technically termed) is is milled, and this milled groove is on a very large radius, so that readers can readily understand what the pin A on the jig shown at Fig. 2 is for, namely, that the work pivots around this centre point. We have so far, in this view, not called the reader's attention to anything except the jig and the operation, but now let us speak of the machine itself. On first sight this looks like a vertical miller, but is it? On a second glance we see it is nothing more than a converted Le Blond Lathe, and a very clever conversion at that. Again proving that for special purposes, there is always a way out, providing, of course, you try hard enough to find it.

There are many other operations of special note that we cannot touch for lack of space, but will just mention a few before passing on to another part of the mount. The worm which fastens in the portion milled, (just spoken of in Fig. 2) is cut on a special machine for the purpose. The rocker is also scraped in, and friction strip fitted, when the yoke and its various detail parts are assembled.

The sight bar head will next be discussed, and in order to give the readers some idea of its general appearance, the photo at Fig. 3 was taken.

As can be readily understood by readers, this is a most important portion of the mount, and entails considerable accurate work before its completion. It will be noticed that this head is all finely graduated, and when it is mentioned that the scale on the dial A must tally up with the scale at slide B, or graduation strip as it is sometimes called, it will be realized just what this means, namely, that every operation throughout must be most carefully checked and followed up.

It will be noticed that there is a rack cut at C on this piece. This is accomplished on the miller by a special fixture for the purpose, which travels the work at the correct radius. A special indexing attachment is also part of this fixture. Another very interesting milling fixture on this portion is shown at Fig. 4. This fixture, by means of the handle A, travels in the correct radius to allow the portion B to be machined. The method of holding the work is self-apparent. This operation is done on a Le Blond Miller with splendid success.

At Fig. 5 we show still another milling fixture on this piece, completed on a Cincinnati Miller. This jig is constructed on the radius principle, all the work pivoting from the pin A, and swinging at the correct radius for the work. Numerous operations are performed on this principle, until the sight bar heads' completion. It might be interesting to mention that this portion is a drop forging of nickel steel, and originally weighs 150 pounds in its rough state. Before completion, however, it keeps reducing its weight operation by operation, until when completed it only weighs 40 lbs., a difference of 110 pounds, which, to say the least, is some difference. All these operations are from the solid, as this

piece must be without flaw of any kind. The groove seen on Fig. 5 at B is approximately 3/8 in. wide, 1 1/2 in. deep, milled out of the solid.

Recoil Cylinder

First, this cylinder is made from a steel forging, which comes to the factory in a rough-turned state. The various finish-turning and boring operations are then completed. A bronze bush is now pressed in place, after which a special shaped keyway is machined. This is not in a true measure a keyway, but rather a passageway for the glycerine, which goes inside of this cylinder for recoil purposes. Let us explain the action of this glycerine before going further.

When the gun is fired, naturally there is a sharp recoil. This would ruin the gun in short order if no provision were made to take up this jar, therefore, the reason for both the recoil cylinder, and the recoil spring cylinders, but let us, for the present stick to the recoil cylinder alone.

When the recoil cylinder is finally completed it is filled with a certain amount of glycerine. This acts in the following manner. Immediately at the start of the recoil, the piston inside this chamber has a tendency to rush back with great force. It does this in fact, for a portion of its length of travel, which brings up to the discussion of the possageway already spoken of. This groove is about 1½ in. wide at one end, but tapers down to ¼ in. wide at the other, the object being as follows: As the piston comes back, its speed is narrowing down, therefore, not allowing as much glycerine to go through as at the start, or the wide end of the groove. Naturally the more resistance offered to the piston the slower its travel, and the greater the cushion effect. The narrower the groove the less glycerine going through, and therefore, the greater the cushioning effect.

Before going on to the recoil spring cylinders and their functions, let us study Fig. 6, and see how these recoil cylinders are tested. They are placed on a wooden stand as shown, after all machining operations have been completed, and connected up to an oil pump to the left. It is now tested to a pressure of 3,300 lbs. for leaks. The idea of having glycerine in the tubes on the gun, is in order that they will not freeze up in cold temperatures. Perhaps it would be best to state that it is not pure glycerine that is contained in these cylinders, but a mixture of glycerine and water. The pistons for these cylinders are also forgings, and made from a special alloy steel.

Inspection

Before going on to the two remaining photographs let us see what methods of inspection are adopted.

From the very outset the system of inspection is most rigid, for one flaw might mean the loss of a ship. This may seem a rather wild statement, but when one considers that perhaps while a gun was training on its target it refused to act, that target, which, ten chances to one, is another ship, has an equal chance to fire on the ship with the jammed gun. For this reason the authorities are most strict in their tests.

To go over all these tests would occupy an article in itself, enough to say that special test stands and tables form a part of the inspection department, together with a regular host of gauges of all descriptions, pin, snap, and the other numerous varieties, feelers of very fine quality being frequently used. Even zig-zag cigarette paper is used in conjunction with the square, and this paper must absolutely refuse to draw at any point on the square.

Should any large size discussion arise as to the accuracy of any gauge throughout the plant, they have a Pratt & Whitney Precision measuring machine, all enclosed in its own particular compartment, which settles beyond a doubt the question of accuracy.

Scraping

The amount of scraping to be done on this product is surprising, the biggest part of this scraping being on the sight head and its component parts. This firm has trained men who knew nothing whatever of scraping into expert scrapers, turning out work that is a treat to look at, and accurate in all particulars.

Final Inspection of Gun

The gun mount is finally assembled on a special assembling stand, and the barrel, breech, telescopes and all attachments placed on the same. Fig. 1 illustrates this view clearly. The chief naval inspector now tests the gun for accuracy in the following manner. He first lines up the telescope H with the centre of the barrel. He then lines up this telescope with the cross marks, or targets shown in Fig. 6. After the gun is tested on these marks the barrel is elevated to run up the lines A and B, see Fig. 6. At top of these lines is a parallel line joining these two vertical lines, and the gun must now to be swung around on its base. with the sight on

FIG. 2. MILLING THE YOKE ON CONVERTED LATHE.

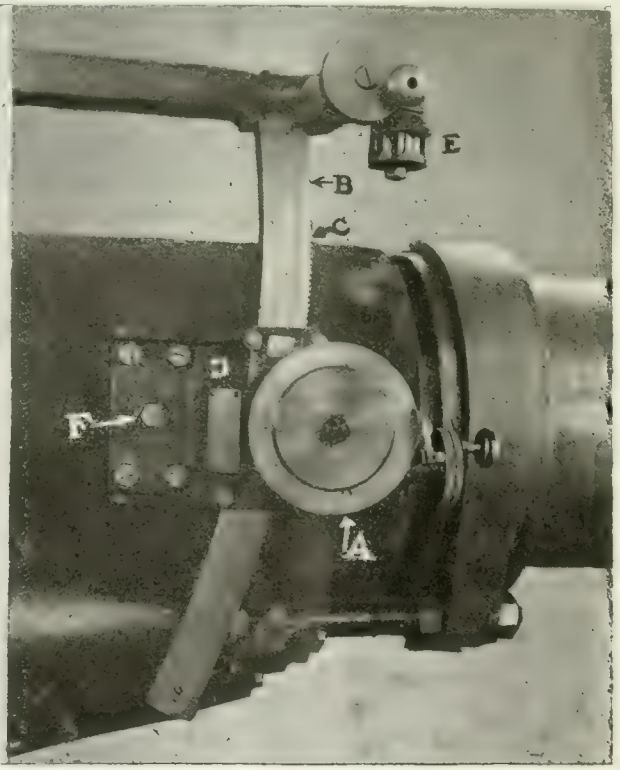


FIG. 3.—A CLOSE-UP VIEW OF THE SIGHT BAR HEAD.

the barrel never deviating from the mark, even by a hair's-breadth. Should the alignment not be perfect, the gun is disassembled if necessary, and the change made to ensure absolute accuracy.

As the readers will note, accuracy and interchangeability of all parts must be had, and is essential on all component parts entering the completed mount, as any damage which might be attributed to gun-fire from the enemy can be instantly repaired by removing the damaged parts and replacing same with similar spares in stock. In order to attain the foregoing, two important factors must be contributed:?

(1.) The manufacturers at Dominion Steel Products Corporation have contributed their ingenuity through the use of excellent standard fixtures, which parts so assembled in same and completed, must be interchangeable, through the system of coast inspection after each operation.

(2.) The Government or final inspection insures that all the drawing dimensions are kept within the prescribed tolerances allowed, and this inspection is attained through a United States Government office.

The Naval Inspector at Munhall has charge of the inspection throughout the several middle Atlantic States and that part of Canada extending from Detroit to Montreal, Brantford, Toronto and Hamilton, coming under the cognizance of the Munhall Office, and commanded by Commander R. R. Adams, U. S. Navy.

The Munhall district is divided into four sub-divisions, of which the north-eastern sub-division is located with headquarters at Erie, Penn., under Lt.-Commander C. H. Fischer, U.S.N. Rt., with a corps of assistants and sub-offices scattered throughout this district. The officer in charge at the Brantford plant is Ensign F. J. Chatel, and the inspectors are largely enlisted personnel trained at Great Lakes Naval Station, and civilian sub-inspectors.

Before leaving this article, the writer believes that some particular mention should be made of this inspection staff, so, to give readers an idea of the staff and its leader, we illustrate at Fig. 7 the inspection department as far as the sailors are concerned. The gentleman marked with a cross is the ensign himself, and a brief sketch of his experience would not be amiss.

His name, of course, comes first. Ensign F. J. Chatel, U.S.N.R.F., comes originally from Detroit, Mich. He is a graduate of Michigan University of Mechanical Engineering. Started as an ordinary sailor, but by energetic work obtained his commission at sea. Has been 1½ years at sea. He received his commission on April 7th, 1917 on board the U.S.S. Huntington. On this ship he had charge of a division of engineers. Such an experience, as readers will agree, well fits a man to handle important work such as he is now concerned with.

To put it briefly, we can say without any attempt at flattery, that first, the Dominion Steel Products Co. are turning out a great product in a great way, and Ensign Chatel and his staff are helping in a like manner to ensure the accuracy and usefulness of this product.

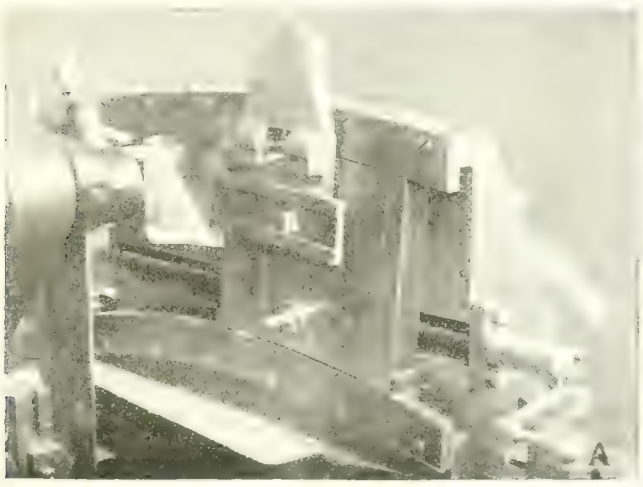


FIG. 4.—JIG FOR MILLING SIGHT BAR HEAD

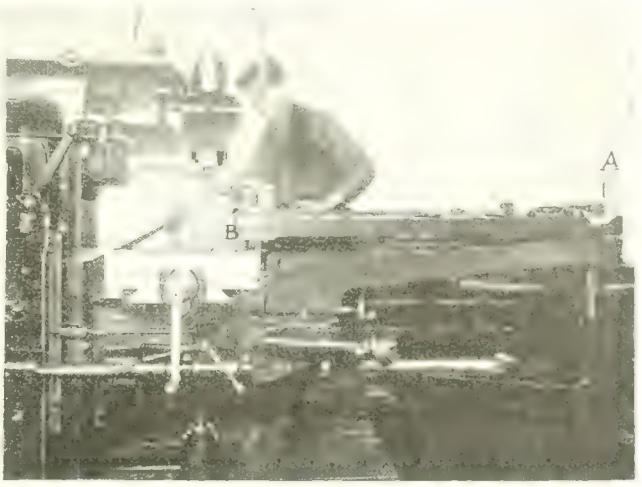


FIG. 5.—ANOTHER MILLING OPERATION OF SIGHT BAR HEAD

It is stated that the Japanese are exploiting on a large scale the ores discovered in Korea, and are making extensions in their industries to handle this new source of supply. Ore concessions in China will further increase the Japanese raw material. A British correspondent predicts not only that Japan will soon be independent of outside sources of supply, but that in another ten years she will be exporting cheap steel to the Pacific markets, and even breaking into more distant markets like Great Britain.

FIG. 6.—A VIEW SHOWING THE SIGHTING END OF THE SHOP.

FIG. 7.—A GROUP OF U. S. INSPECTORS, TOGETHER WITH THE ENSIGN, MARKED WITH A CROSS.

Some Factory Sites Not Cheap, Even as a Gift

There Are Many Factors, All of Which Should Be Considered, if the "Free Site" is Not Going to Turn Into a White Elephant on Your Hands

On the correct selection of a suitable habitat, much of the future of a new industry may depend. The factors governing this selection are so many and so diverse in their aspects, that it is quite easy to go wrong, even when the choice would appear to be quite obvious.

The erection of a new manufacturing plant may be for the purpose of carrying on a new industry, or to provide needed space for a going concern. Again it may be to provide a branch factory for a firm whose main factory is in another country. Many examples of this latter case are found in the American firms with branches in Canadian territory.

While the choice of a suitable location is important to any industry, it is most so in the case of the business just entering the industrial world. This has all its connections yet to make, both on the buying and selling end, whereas the factory which is a branch of an already well established firm has a great deal of this question already solved for it.

Some of the Factors

What are the most important requirements for a factory plant? If these are known, then in the search for a location, some definite standard can be aimed at, and a process of elimination gone through.

The first of these requirements is geographic position in relation to supply of raw material, and the market for the finished product.

Transportation facilities would naturally be the next feature to be considered.

Labor supply, health statistics, educational facilities, general aspect of the immediate locality and its environments, and lastly, the cost of land and taxation assessments. These are put last because they are really the most easily surmounted difficulties. This is true, although sometimes they are considered first, and allowed to loom in importance over more vital points. There are hundreds of small towns vieing with each other to secure new industries and these towns are willing to offer very tempting inducements as far as land costs go. These offers are often so tempting that the seeker after new fields is inclined to look at the disadvantages through the wrong end of the telescope. Some of these offers approach the grotesque in their liberality. For instance a certain town offered recently to give an industry ten acres of land on a railway siding, build a one-storey fireproof factory containing 30,000 square feet on this land, and turn it over to the company free of water rates and taxes for ten years. In addition they are offered power at the rate of ½ cent per k.w.h.

Now an offer like this is really brilliant enough to dazzle anyone. On the other hand should it not make the thoughtful investigator pause and see why the municipality should offer to give away its ratepayers' property so freely? Sometimes it does, sometimes not.

While cheap land and exemption from taxation for a period of years is a consideration, it can be easily outweighed. For instance to take an extreme case, free land and taxes would not be much help to a lumber mill, if it was situated on a prairie. In a case like that the mill would be in a bad position, both in respect to its raw material and its finished product.

It is more important to be close to the source of raw material than to the market for the finished product. This fact really determines the case for certain kinds of industries. Lumber and pulp mills will always be found in situations such that the wood can be delivered from the limits by water. Steel mills will be in a position ensuring easy delivery from the ore deposits, preferably by water, ensuring cheap freight rates.

The advantage of close proximity to raw material sources rather than selling fields are obvious. Sales are made usually over a widely diffused area, whereas raw material is concentrated. In the case of transportation troubles arising, as often happens in this country in Winter, accessibility to raw materials is a boon.

Inability to ship finished products will lead to congestion in stock and shipping rooms, which is inconvenient, but if the raw material supply is cut off nothing else but shut-down can be looked for. Distance from supply means carrying of large stocks, which is again unfavorable, as it prevents advantage being taken of favorable changes in the market.

We have thus determined on some general qualifications, that the site selected must be easily accessible to the field of supply.

How About Transportation?

Transportation facilities are next to be considered. The municipality angling for the factory is almost sure to be able to offer a siding or spur into the factory grounds. This is very desirable but needs careful examination. If the town is on a branch line, with a poor freight service, the fact of having a siding is not such a help. It would be better to have a location in a town on a main line, even if some trucking has to be done between factory and freight shed. If freight service in the locality under consideration is good, and a siding can be secured, connecting with a main line of railway, then local conditions affecting transportation must be considered.

The climate of Canada in Winter is such that it must be considered very carefully in making selections. It is not always so considered, and neglect of this precaution has involved many manufacturers in much expense.

The factory may be reasonably close to the railroad, and be connected thereto by a siding, and that siding and its approaches may be a source of trouble for six months of the year. There are districts in Canada where snow is to be looked for in quantities from November until April. Local topography may be favorable to drifts, or otherwise, and for the former, one can readily see where the siding will be. Instances where the whole yard force of a factory are kept busy two thirds of their time during the Winter in keeping the tracks clear of snow are not hard to find. One case occurs to the writer where two factories were near neighbors. One had a siding and extensive trackage in the yard. The other had no siding. During the Winter the factory without the siding sent its product out on sleighs to the freight shed without a hitch. The other factory had its yard gang employed day after day opening up the track to get the freight cars in to the shipping room.

This point may not occur to one looking the ground over in Summer, but it is a real live question in many districts of Eastern Canada.

Power for the Plant

After the question of transportation comes that of power for the factory, and this is another question which requires careful consideration. If the product is such that a large amount of steam is required for process work all the year round, and heating in the winter, then it is likely that the installation of a steam plant would be advisable. If cheap electric power is available locally then careful consideration of the nature of the load will have to be made before the type of power is decided on. Here again the nature of the local climatic conditions should be carefully considered, and statistics over a number of years should be consulted.

Power may be cheap and plentiful, but the cost of

heating may be such as to overshadow the cost of power altogether. In such a case it is cheaper and better to generate the power on the permises, having the use of the exhaust steam for heating all Winter. The cheap power may be available in the Summer months, affording an opportunity for a thorough overhaul of the steam generating plant.

If Winter conditions are consistently bad, then the other advantages offered must be very great to outweigh this factor. If conditions in Winter are such that only a medium amount of heating is necessary, then the possibility of cheap electric power will be a great inducement. If a steam plant is to be installed, the question of obtaining the necessary coal must be studied.

Sizing Up the Labor Market

The amount and the type of labor in the locality is of course an important item. The general standard of living and education in the neighborhood will give an idea of the possibilities of getting intelligent help. Are the characteristics of the town such that a good class of labor can be attracted to it? Are the municipal authorities up to date, and capable of improving the standing of the place? Is the water supply good and is the hygienic standard of the town what it should be?

A town that already has some manufacturing plants in it is liable to furnish a better class of labor than one in which an industrial plant is a new feature.

The population of the latter is likely to be chiefly engaged in rural or semi-rural pursuits. This type takes but slowly to the work in the factory, and furthermore, there is but little reserve to draw on. A centre that has been the home of manufacturing plants for a good period is likely to have a floating population to draw on. Nearness to a large centre of population is undoubtedly a great help in the labor question, as far as ensuring a supply goes. The wage scale, of course, may be affected by the prevalent scale in the larger centre, but this is balanced by the better class of labor available. The cheap labor of the small rural town is often very dear. The men have to be trained and taught, and those who have the ability to learn quickly usually drift away as soon as they become useful. They go to the larger centres and exploit the skill they have obtained at the expense of the manufacturer in the small town. The prospect of future growth is also to be considered. Cases in which large plants have been erected in small towns with the idea that the presence of a large factory would stimulate growth, thus insuring a good labor supply, are fairly frequent. Sometimes it has turned out that way and again it has not. There is a case where after ten years the population of the town has decreased and the labor question is serious.

The trouble with a semi-rural population is that a large number subsist partially on the product of their own land. Their requirements are few and their ambition lacking in proportion. This class of labor have but little inducement to steady work. They are inclined to put in part time at the factory to help their income and refrain from working about an equal part. They are inclined to resent the introduction of strangers and make things uncomfortable for them. This attitude makes it difficult for the management to keep its forces up to strength.

Local conditions have a great influence on the filling of the higher positions in the factory. If housing accommodation is poor, sanitary arrangements not of the best, and educational facilities lacking, it is difficult to get the right kind of man to settle in the town. Even an enhanced salary will not attract, as the absence of the comforts to be obtained in better managed centres is weighed against the extra money. Out of date sanitary arrangements react on the general health of the workers, and causes a great deal of lost time through illness. Further it predisposes the population to epidemics, which may result in anywhere from 25 to 50 per cent. of the help being laid off for weeks at a time.

It can readily be seen that cheap land and exemption from taxation cannot begin to overbalance such drawbacks. Generally speaking a town that possesses real tangible advantages does not need to go to extremes in offering inducements to new industries, but there is no question that where there is competition between nearby localities for manufacturing plants, the manufacturer stands to get real concessions.

Opinions of Manufacturers

In view of the foregoing these following opinions from men in a position to speak with authority should be of interest:

"What is the best location for a factory? If you were beginning all over with the knowledge you now have, where would you locate?" Those were the questions which CANADIAN MACHINERY put to a half dozen leading manufacturers of Western Ontario, and to the Industrial Commission of the leading purely industrial cities in Canada.

It is the business of Mr. C. W. Kirkpatrick, Industrial Commissioner, of Hamilton, to be posted in such subjects; tnough, naturally, he is inclined to think that the questions can be answered with one word, "Hamilton!" Mr. Kirkpatrick would put labor supply first in the list of requirements, and, as a matter of fact, everyone interviewed held that view. "Some places seem to be better than others in this respect" said he. "'Hamilton is now a centre for the steel and iron industry, which requires male help exclusively. This leaves a surplus of female labor and provides for textile industries.

"If it is a large industry I should place a good supply of cheap power as next in importance. This has been a big factor in building up Hamilton. You know we had a hydro-electric of our own before Sir Adam Beck entered the field, and even to-day its rates are more favorable.

"Third place I should give to shipping facilities. We are served by lake and rail. Possibly the big manufacturer would rather be located close to his raw material rather than to his markets, though he is fortunate indeed if he can secure a location giving him both.

"A fourth advantage is to locate where there are other industries established, in a well known industrial centre. Finally need I say that the man seeking a factory location will realize that an industrial commissioner is necessary in any live centre. He not only brings in new industries, but acts as a buffer between the industries established and the municipality. There are always things coming up in every industrial community which have to be smoothed down, a work which is easier for our industrial commissioners than an alderman to do."

Col. Harry Cockshutt, of the Cockshutt Plow Co., Brantford, would put labor supply and freight rates as of nearly equal importance in choosing a location. "Western Ontario is the ideal location. Rates are better in the Western peninsula than in any other part of Canada, and the labor supply is exceedingly good."

"Location means nearly everything to a manufacturer, particularly on starting business in a small way," said Mr. John Muir, of Goold, Shapley & Muir, Brantford. "The average manufacturer, when starting business, needs all his capital to make a beginning and keep his business running until it is on its feet. He does not want to lock up a lot of money in building and real estate, which he should have liquid. Take our own case. About sixteen years ago we were almost wiped out by fire and the people of Hamilton tried to get us to go over there and take the old Singer Sewing Machine plant. Brampton also had an idle factory, equipped, and offered it to us free of rent and taxes. In that case the building was the big attraction to us, and we should have moved had not Brantford made attractive offers for us to stay. Freight rates were then better there than here, though at present there is no city in Canada better served by rail than Brantford.

"You can not induce manufacturers to come to a place unless you can show them that there is favorable accommodation. Recently there was a by-law passed here to guarantee the bonds of the Realty Co. This company proposes to build factories to order and offer them to American manufacturers looking for a Canadian location

at 5 cents to cover interest and sinking fund. The dividend of the Packing Co. is limited to 6 per cent.

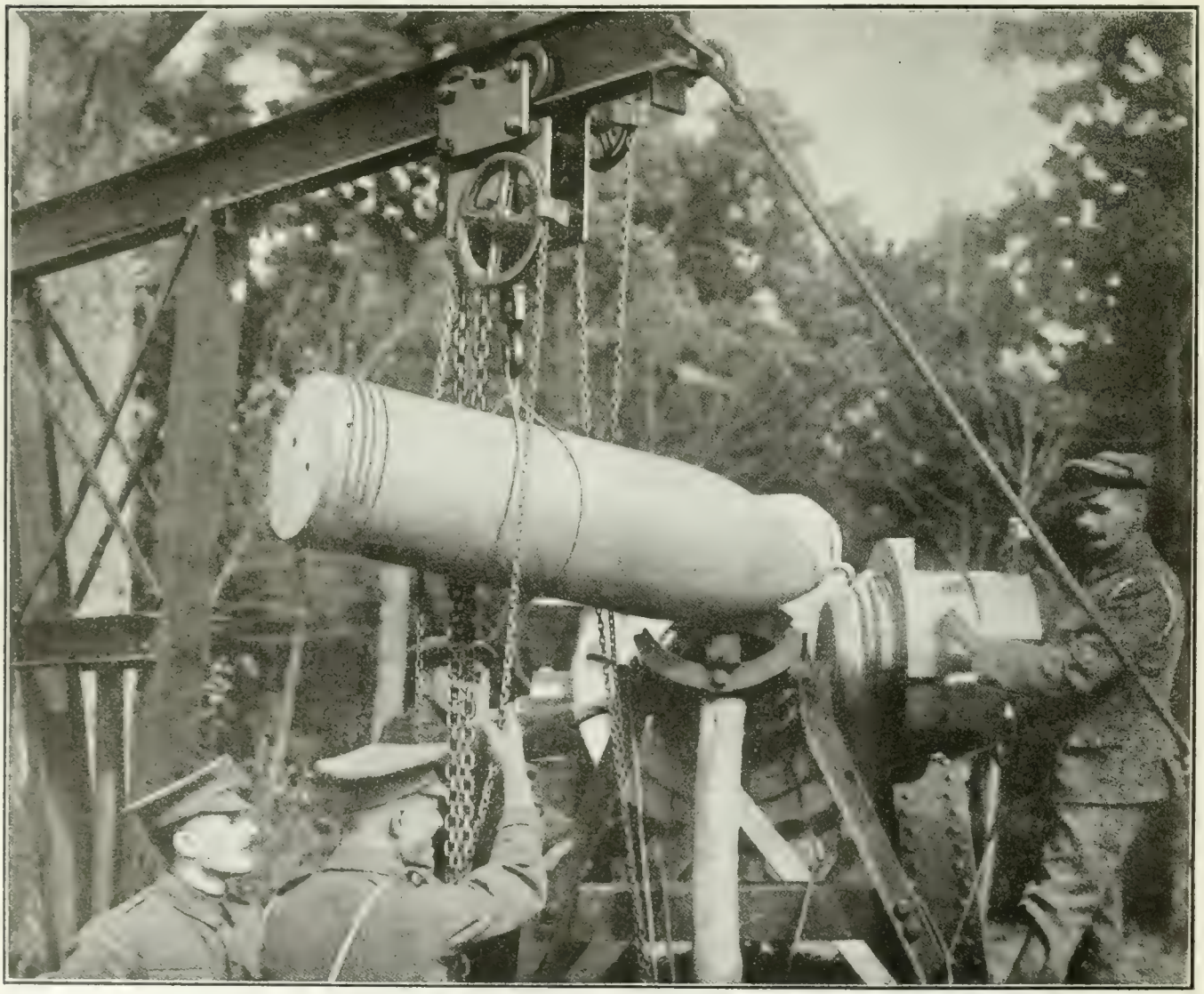
"No manufacturer can afford to neglect the Ontario [illegible] Ontario has been the life of the Ontario manufacturer for years past."

Mr. Reid, of the Westinghouse Co., Hamilton, emphasized the necessity of amusements in a district to make it attractive to labor. Shipping facilities and cheap power were great essentials. In the Westinghouse business the line of raw materials used is varied, and it is hard for them to get near the source of supply. They can get their pig iron in Hamilton, but their copper comes from New England and their wire and cable from Montreal; so that in their case shipping facilities and labor supply are probably the most important considerations.

Mr. Hobson, of the Steel Co. of Canada, would put labor conditions as the prime requisite. Next, he considers nearness to consuming market, and third nearness to raw material. He looks on the location of his company as so favorable in all respects that it is hard to rank the conditions. "We can assemble our ores cheaper in Hamilton than they can in Pittsburgh," he said. "There is a great deal in being close to your market, however. Ordinarily, 75 or 80 per cent. of our products are consumed within a radius of 75 miles of Hamilton. We are in the hub of the manufacturing centre of Canada. When you are close to your consumers you can get the goods to them overnight, and in this we have the advantage over other steel producing centres. It seems to me that the great future of the steel industries in Nova Scotia is in the export trade. We could have made a great deal of money during the war by going deeper into the export business than we did, but we were anxious to look after our Canadian customers."

A toolmaker was confronted with the job of removing a bushing which was fitted very tightly in a blind drilled hole. There was not space enough at the bottom of the hole to get in a hook of sufficient strength to pull out the bushing. After several different methods had failed, the tool maker fitted a steel rod quite accurately into the bushing, filled the hole with heavy oil, inserted the rod and drove it in with a hammer against the oil. The fluid pressure of the oil was transferred to the inner end of the bushing, and forced it out with very little difficulty.

Centrifugal pumps for boiler-feed work, steam turbine driven by direct connection, are now to be had in small sizes. The pump, turbine, and supports are combined in a single unit. The solid shaft is hung in two ball bearings, and only one stuffing box is used. The packing between bearings and steam end is a floating carbon ring, the bearings being kept uniformly lubricated by a constant-level oiling device. An excess-pressure governor and a minimum-pressure safety stop make the operation practically automatic.



LOADING A 15-INCH SHELL INTO THE BREECH OF A HOWITZER AT THE FRONT BY MEANS OF A MORRIS SPUR GEAR CHAIN BLOCK

Shop Arithmetic, Geometry and Trigonometry

Ninth of a Series in Practical Mathematics For the Mechanic and Those Learning the Machinist Trade—The Present Article Takes Up the Subject in the Title.

By J. H. RODGERS

WHILE the mensuration of regular plain figures, as explained in our last lesson, is a comparatively easy process, there are occasions when other means must be adopted before a solution can be obtained. This is particularly true where angles are given in specified dimensions and a practical solution necessitates certain conversions so that the corresponding lengths can be determined from the other known factors. In the construction of jigs and fixtures it is frequently required to check the accuracy of certain calculations, and it is often necessary to figure out the distances between holes, or holes and surfaces, and to perform this work satisfactorily a knowledge of geometry and trigonometry is of vital importance. Do not let the mention of trigonometry discourage any reader who is not familiar with its application, as many shop problems can be made much easier if recourse to this branch of mathematics is resorted to. It is not intended that a complete treatise of this subject will be given here, but sufficient elementary principles will be dealt with to prove to the student the advisability of acquiring some knowledge of trigonometry, so that many shop problems may be tackled with greater confidence, and permit the workman with such learning to undertake many jobs that formerly were considered quite difficult.

Before giving any concrete examples we will endeavor to put the reader at his ease regarding certain fundamental details pertaining to the subject "trig." As the name implies, trigonometry is a treatise on the solution of triangles, and as every triangle has three sides and three angles, the purpose of "trig" is to find the dimensions of some of these angles and sides when those of the others are known. In a previous lesson on proportion it was shown that the corresponding lengths of lines of similar figures vary in direct relation to their position. This principle is the basis of trigonometry and all the constants used in this section of mathematics are determined with a circle of one inch radius. To illustrate the principle of "trig" the following sketch is given.

Suppose that the angle C-O-F is 20 degrees, and the lengths O-A-O-B and O-C to be 1, 2 and 3 inches respectively, it is clearly seen that all other similar lines are in the same relative proportion. In order that this subject should meet the every day requirements of the engineer and mechanic, tables have been prepared, and these can be found in any good technical text book, their degree of accuracy depending on whether the constants are given for degrees, degrees and minutes, or degrees, minutes and seconds, the last-mentioned being calculated for every 1/1296000 part of a quadrant of a circle. In general, the tables are invariably made out for degrees and minutes, the value of the seconds being calculated from the differences between the nearest minutes.

In the study of trigonometry there are several functions that determine the value of the respective angles and the lines by which the angles are formed. The most important functions are the sine, cosine, tangent and cotangent. These are shown in the accompanying figure:

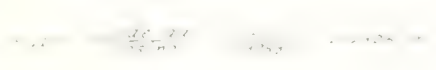
In the study of "trig." and in all tables of functions, it must be understood that the values given are based on angles calculated in a circle of one inch radius. To give a graphical illustration of the four functions given above, therefore, first draw the horizontal line X-Y, and with O as a centre draw a circle of one inch radius. Now suppose we desire to show the position and lengths of the functions for a 60 degree angle. Through the centre O draw the line O-F at an angle of 60 degrees. From the point D, where this line cuts the circumference of the circle, drop a line D-A perpendicular to X-Y. The line D-A will be the sine of the angle, and will be found by measurement to be .86603 of an inch in length. The length O-A will be the cosine of the angle and will be .5 of an inch in length. From the extremity of the one inch radius, or from the point B, erect a perpendicular and extend it until it cuts the inclined line O-F. The length B-F will be the tangent of the angle and will measure 1.73205 inches. From the opposite end of the 90 degree arc draw the horizontal line C-E parallel to the base line. The length C-E will represent the cotangent of the angle and will equal .57735 of an inch in length. These values are constant for a one inch radius and 60 degree angle. Other functions than the four above-mentioned may be used in trigonometry, but for all practical purposes these four are ample for all shop calculations.

For the students' convenience we have reproduced a table with the constants of the various functions from 1 to 90 degrees, by variation of half degrees, but for greater accuracy we would recommend the use of a table where the values of every minute are given.

Using letters shown in the functional sketch, the following rules may be used for the solution of right triangles, examples here given being for a radius (hypotenuse) of one inch, and 60 degree angle. Suppose we have three holes to locate in a die block and the dimensions given are shown in the sketch; what is the exact centre distance between the other holes?

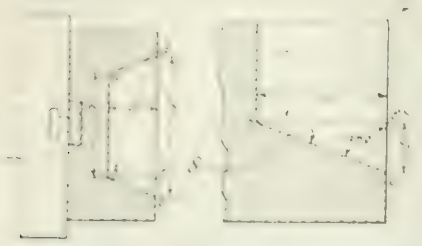
It will be seen that the centre lines of the holes form a right triangle A-B-C, and from the rules given the solution for the distance B-C would be the tangent for a 25 degree angle, this being .46631.

For the length A-C the solution would be:



In the construction of a forming die as shown in the sketch below, it is desired to know the angle at which to set the compound rest to turn the surface

S, and also the length of the tapered portion.



The correct length may be found by extracting the square root of the sum of the squares of the two sides, or

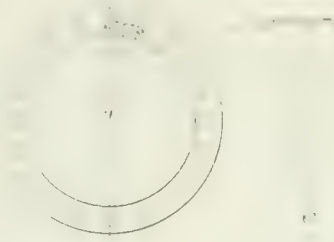
To find the estimation of the compound rest, or the angle B-C-E, we can use the rule:

This value lies between the constants given for the tangent of 69 degrees and 26 minutes, and the tangent of 69 degrees and 27 minutes, so for close enough work a setting can be made of either one of these angles.

In a previous lesson on proportion it was shown how the height of a chimney or other elevation could be calculated, but greater accuracy could be obtained by the use of "trig." The sketch below shows the method of procedure:

Suppose by the use of the surveyor's sextant that a sight is obtained to the top of the stack at an angle of 28 degrees, when at a distance of 100 feet from the base of the chimney, the diameters of the top and bottom being as shown. The height is calculated by the rule:

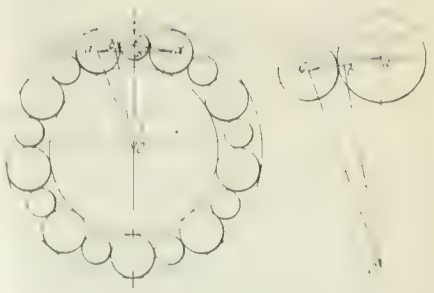
Twenty equally spaced holes are required to be located on a circle 18 inches in diameter; what must be the spread of the trammel points to step off the hole centres?



As there are 20 holes on the circle it is seen that the angle formed by two adjoining radii will be 360 20 = 18 degrees, and the angle C-O-B will be one-half of this, or 9 degrees. The chord A-B is the length required, and this is found by solving the right triangle O-C-B. With the centre angle and the hypotenuse known the short side C-B may be calculated by the rule:

This, then, is the length of half the chord, so that the trammel distance will be double this, or 2.81574.

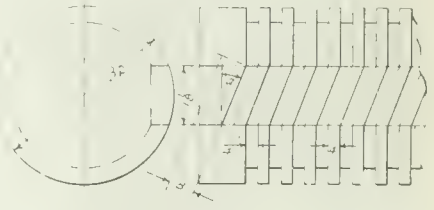
Suppose we are making a ball race in which a series of nine ⅜ inch and nine ¼ inch balls are to be used, all the balls to touch those adjoining, what will be the mean diameter of the race?



The above sketch illustrates a general layout of the race and the factors necessary for determining the desired diameters. The angle formed by the central radii of any two adjoining balls will be 360 18 = 20 degrees, and the centre angle of the right triangle O-B-C- will be 10 degrees. The mean radius of the ball race will be equal to the hypotenuse of the right triangle. The rule to apply would be:

Therefore, the mean diameter of the ball race would be $1.8 \times 2 = 3.6$ inches.

In a certain sheet metal-working machine a head is advanced by the action of a special cam shaft that revolves through the centre of the head. Each revolution of the shaft advanced the head ½ inch, and this movement takes place in about 1-10 of a revolution; the head being stationary through the remaining 9-10. A sectional view of the arrangement is shown below.



°	′	Sine	Cosine	Tan	Cotan	°	′
1		01745	99985	01746	57 2900	89	
	30	02618	99966	02619	38 1885		30
2		03490	99939	03492	28 6363	88	
	30	04362	99905	04366	22 9038		30
3		05234	99863	05241	19 0811	87	
	30	06105	99813	06116	16 3499		30
4		06976	99756	06993	14 3007	86	
	30	07846	99692	07870	12 7062		30
5		08716	99619	08749	11 4301	85	
	30	09585	99540	09629	10 3854		30
6		10453	99452	10510	9 5436	84	
	30	11320	99357	11394	8 7769		30
7		12187	99255	12278	8 14435	83	
	30	13053	99144	13165	7 59395		30
8		13917	99027	14054	7 11537	82	
	30	14781	98902	14945	6 69116		30
9		15643	98769	15838	6 31375	81	
	30	16505	98629	16734	5 97576		30
10		17365	98481	17633	5 67128	80	
	30	18224	98325	18534	5 39552		30
11		19081	98163	19438	5 14455	79	
	30	19937	97992	20345	4 91516		30
12		20791	97815	21256	4 70463	78	
	30	21644	97630	22169	4 51071		30
13		22495	97437	23087	4 33148	77	
	30	23345	97237	24008	4 16530		30
14		24192	97030	24933	4 01078	76	
	30	25038	96815	25862	3 86671		30
15		25882	96593	26795	3 73205	75	
	30	26724	96363	27732	3 60588		
°	′	Cosine	Sine	Cotan	Tan	°	′

°	′	Sine	Cosine	Tan	Cotan	°	′
16		27564	96126	28675	3 48741	74	
	30	28402	95882	29621	3 37594		30
17		29237	95630	30573	3·27085	73	
	30	·30071	95372	·31530	3 17159		30
18		30902	95106	·32492	3 07768	72	
	30	31730	94832	·33460	2 98868		30
19		32557	94552	34433	2 90421	71	
	30	33381	94264	·35412	2 82391		30
20		34202	93969	36397	2·74748	70	
	30	·35021	93667	37388	2 67462		30
21		·35837	·93358	38386	2·60509	69	
	30	36650	93042	39391	2 53865		30
22		37461	·92718	40403	2·47509	68	
	30	38268	92388	41421	2 41421		30
23		39073	92050	42447	2·35585	67	
	30	·39875	91706	43481	2·29984		30
24		40674	·91355	·44523	2 24604	66	
	30	41469	90996	·45573	2·19430		30
25		42262	·90631	·46631	2 14451	65	
	30	43051	90259	·47698	2 09654		30
26		43837	89879	48773	2·05030	64	
	30	44620	89493	·49858	2·00569		30
27		45399	89101·	50953	1·96261	63	
	30	46175	88701	·52057	1 92098		30
28		46947	88295	53171	1 88073	62	
	30	47716	87882	·54296	1 84177		30
29		48481	87462	54431	1 80405	61	
	30	·49242	87036	·56577	1 76749		30
30		50000	86603	57735·	1·73205·	60	
	30	·50754	86163	58904	1 69766		
°	′	Cosine	Sine	Cotan	Tan	°	′

°	′	Sine	Cosine	Tan	Cotan	°	′
31		51504	·85717	60086	1 66428	59	
	30	·52250	·85264	·61280	1 63185		30
32		52992·	·84805	·62487	1·60033	58	
	30	53730	·84339	·63707	1 56969		30
33		54464	·83867	64941	1·53986	57	
	30	55194	83389	66189	1 51084		30
34		55919	·82904	·67451	1·48256	56	
	30	56641	82413	·68728	1 45501		30
35		57358	·81915	·70021	1 42815	55	
	30	58070	·81412	·71329	1 40195		30
36		·58779	80902	·72654	1·37638	54	
	30	59482	80386	·73996	1·35142		30
37		60182	·79864	75355	1 32704	53	
	30	60876	·79335	·76733	1 30323		30
38		61566	·78801	·78129	1 27994	52	
	30	62251	78261	·79544	1·25717		30
39		62932	77715	80978	1 23490	51	
	30	63608	77162	·82434	1 21310		30
40		64279.	76604	·83910	1 19175	50	
	30	64945	76041	·85408	1·17085		30
41		·65606	·75471	·86929	1·15037	49	
	30	66262	·74896	·88473	1 13029		30
42		·66913	·74314·	90040	1·11061	48	
	30	67559	·73728	·91633	1·09131		30
43		·68200	·73135	·93252	1 07237	47	
	30	68835	·72537	·94896	1 05378		30
44		69466	71934	·96569	1·03553	46	
	30	70091	·71325	·98270	1·01761		30
45		70711	·70711	1·	1·	45	
	30						
°	′	Cosine	Sine.	Cotan	Tan.	°	′

The cam strip is fitted into the shaft and has a width of 1¼ inch. The axial distance between the cam slots must equal that of the parallel grooves in the shaft, but in shaping or milling these the cross movement of the table will necessarily be less. It is required to find the table movement of the machine when cutting the slots in the strip, and likewise the angle at which the work must rest in relation to the run of the strip. The rule to apply and the solution will be:

This value corresponds to an angle of 23 degrees and 58 minutes, or slightly less than 24 degrees, and this will be the inclination of the table. The cross movement of the table for each operation will be found by the rule:

To secure greater accuracy from the table here shown proceed as follows: Suppose the sine of the angle, after the usual calculations, comes to .57840. It will be seen that this value falls between that shown for 35 degrees and that for 35 degrees 30 minutes. Find the difference between the sines of the two known angles (to the left below) and also the difference between the smaller [illegible] and the required sine [illegible] to the right).

The number of minutes can now be found by proportion, the value .00712 equalling 30 minutes, the difference in the table values. Thus:

The angle corresponding to the sine .57840 will then be 35 degrees 20 minutes and 18 seconds.

History of the Principles of Centrifugal Pumps

The Rees-Ro-Turbo Type of Pump is Herein Described, and Various Illustrations Are Given of Interesting Portions of This Class of Pump—A Reading Will Prove Worth While.

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE going into the construction of this type of pump, let us go back quite a few years, and see where first the idea of centrifugal pumps appeared.

Something over two hundred years ago the centrifugal pump was invented bq Demesne Papin in Hess, Germany. Little seems to have been done with it in a practical way for a long period. It first appeared in this country in 1818, and was known as the Massachusetts Pump. Gradual improvements were made in its design by Andrews in 1839, Bessemer in 1845, Appolod in 1848, and Gwyne in 1851. The development was slow and until within the last ten years was not considered seriously by many engineers, except for large capacities and for extremely low heads.

No doubt the delayed development was largely due to the fact that to get the best results from a centrifugal pump, impellers should be of small diameter running at high speed, but until the advent of the electric motor and steam turbine there was no means of driving centrifugal pumps at the necessary speed except through belting of gearing with their inseparable difficulties and losses in transmission, which neutralized the advantages aimed at in the pumps. With the introduction of electric motors and steam turbines high efficiencies became possible, and for high lifts the old arrangement of impellers in series was revised and the centrifugal pump became a strong competitor of the plunger pump for conditions which used to be looked upon as only suitable for reciprocating pumps.

Perhaps the defect which has been the most difficult to overcome and which has decided the buyer in many cases against this type of pump, has been the fact that it would work at its best only at the exact head for which it was designed, the reason for this being that the blades of the impeller were shaped so as to pass a certain amount of water with the minimum frictional loss, due to cavitation; but if the head against which the centrifugal pump is working reduces, a greatly increased volume of water passes and the impeller then becomes unsuitable for the increased speed of the water through it and begins to act as a water brake, thus creating an overload on the driving machine.

These conditions were well-known and until the introduction of RoTURBo by Rees of Wolverhampton, England, in 1907, it was attempted to overcome them by designing the impeller with blades bent rearwards so as to reduce the break effect. This necessitated increase in the speed of the impeller to compensate for the slip of the water, and beyond a certain amount of recurvature the capacity of the pump is very greatly reduced and the internal friction of the impeller increased with consequent loss of head at anything but a restricted range of service.

True, turbine pumps are of such comparatively recent development that the general public and, in fact, many engineers have not been sufficiently well informed upon the subject to distinguish between a high grade turbine pump and an ordinary commercial centrifugal pump. The Rees RoTURBo pump represents the most advanced in true turbine pumps.

Venturi Pipe

What is know as the Venturi principle is embodied in a specially shaped contraction in a water pipe having an abrupt nozzle where the water enters the construction, and a gradually expanding taper piece after the water has passed the contraction. The result of this is that the water under pressure in the pipe is forced through the neck at a high speed, and in doing so it loses its pressure, in the inverse ratio to which it gains velocity, so much so that the whole pressure can be annulled in the neck if the contraction is sufficient and an actual vacuum can be created. When the water enters the expanding pipe the speed of the same is slowed down again, due to the increasing diameter, and as the speed is lost the water regains its pressure. The Venturi pipe, therefore, is a hydraulic transformer, with a double transformation, converting from pressure into velocity and the velocity back again into pressure, and without much loss.

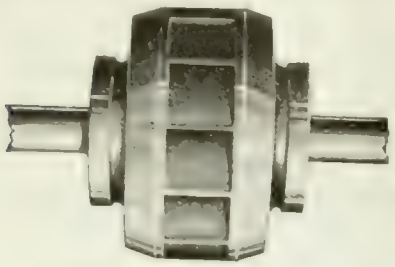
The special shape of the Venturi pipe is because a very abrupt contraction will convert pressure into velocity, but a carefully designed expanding piece of about 10 or 12 degrees expansion is necessary to attain the second conversion, because if the expansion is abrupt the water leaves the sides and the head (instead of being regained) is lost in friction and eddies.

In the ordinary centrifugal pump with an open rim impeller, the object is to pick up the water in the eye of the pump and get up a high peripheral velocity as of the water as it leaves the impeller and convert this velocity into pressure in the expanding channels of the pump casing; a very difficult and inefficient conversion.

These expanding channels are the exact counterpart of the expanding part of a Venturi transformer, but the contracting part of the Venturi transformer was not previously used in centrifugal pumps until what is known as the Rees RoTURBo Pressure Drum replaced the ordinary impeller. The pressure drum is a water chamber of large capacity, in which, by centrifugal force, a pressure is accumulated; the water being flung against the

run by the revolution of the drum and generating a hydraulic pressure inside of the drum. The water is allowed to escape through abruptly contracted openings in the rim, precisely in the same manner as the contracting part of the Venturi pipe.

These openings, or nozzles, are pointed backward, and as the water escapes from them the jets of water have a turbine effect and give self regulation or a



SINGLE-STAGE IMPELLER

reduction of power when the head is reduced and a larger volume than the normal passes through the pump. The contraction of the openings is such that only 25% of the initial pressure is converted into velocity. That is to say, the water going through the nozzles at normal duty has a pressure of 75 per cent. and a velocity equivalent to 25 per cent. only. This velocity is picked up again in the expanding channels of the pump casing, so as to make the total pressure of the water being delivered from the pump equal to the 100% originally intended, but by this arrangement only 25% of the head is picked up in the expanding part, instead of the 100% as in the ordinary pump. As the expanding part of the Venturi transformer is the most difficult to design, and the efficiency of the same depends entirely upon the accurateness with which this part is designed, it will readily be seen why a pump of this type leads in the matter of efficiency.

General Principles

The design of the pump is exceedingly simple, comprising a single or a series of pressure drums (the number depending on the nature of its work), rotating inside a cast-iron casing at a moderately high speed. These revolving pressure drums are mounted on a central shaft supported in bearings. There are no moving parts in contact, except at the bearings, and the whole of the internal arrangements are such that the pump is in hydraulic balance and free from any lateral end pressure on the shaft. The main bearings are external and oil ring lubricated, and packing arrangements are exceedingly simple.

When running the water gravitates or is drawn into the eye of a revolving pressure drum where its speed is slow relative thereto, the water being carried round by the revolving partitions. A pressure is created in the revolving drum by centrifugal action of rotation, and the capacity of the chamber being large the water slowly moves towards the periphery, where there are a number of short nozzles curved in a direction opposite to the direction of rotation. These nozzles convert a portion of the pressure into velocity, and the water passing through them behaves as in a turbine, assisting the rotation of the revolving drum, thereby giving a self-regulating effect. The escaped water still having velocity in the direction of rotation, is passed between stationary diffusion channels which convert the remaining velocity into pressure. A considerable space is left between the revolving nozzles and the stationary channels, greatly minimizing the effect of any wear and tear.

The Rees RoTURBo Pump is a fully developed and well tried piece of apparatus, thousands having been installed in the last few years in all parts of the world. Experience has shown that in many cases where RoTURBo Pumps have been running uninterruptedly for several years with unusually dirty and gritty water, there has been no scouring or wearing action visible when they were opened up for inspection; hence a permanent efficiency is maintained.

Impeller

The special feature of the pump, which (instead of being built as a flat disc runner with the main object of securing velocity of water in the expanding channels of the fixed casing), is designed in the form of a barrel or pressure chamber, the object aimed at being to secure a constant pressure inside the revolving drum or impeller, equivalent to the height of the lift. The impeller having this large capacity, the water inside as it approaches the rim becomes practically stationary relatively to the impeller, thus eliminating frictional losses and generating a pressure by centrifugal force.

Another interesting feature to note is that the highest efficiency point of the Rees RoTURBo Pump is when the speed of the water issuing from the impeller in a rearward direction is 50% of the peripheral speed of the impeller and this for the same reason that the Pelton wheel gives the highest efficiency when the speed of the buckets is half the speed of the water jet. In fact, the Rees RoTURBo Pump may be looked upon broadly as a reversed Pelton wheel in which the buckets are stationary and a series of nozzles on the rim of the impeller revolve, whilst the ordinary turbine pump with the narrow disc impeller is, of course the reversed vortex turbine.

The Effect of Self-Regulation

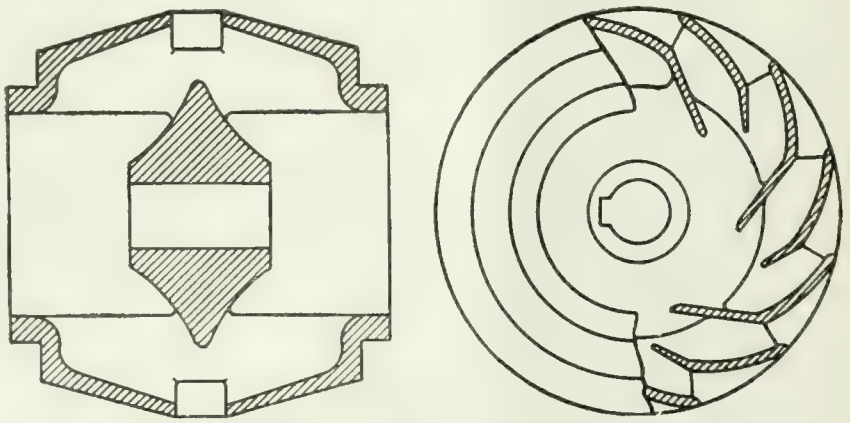
The self-regulating pressure chamber is the equivalent to a pump and a turbine in series, the result being that if the head varies or is reduced below the head for which the pump is designed, there is no overload possible, the turbine rim blades extracting the energy of the increased speed of the water through the impeller, which otherwise would be thrown to waste. It follows, therefore, that the margin of horse power usually allowed on the motor in the ordinary turbine pump for this emergency is unnecessary, it being absolutely impossible for the pump to overload materially the motive power so long as the speed is kept constant, regardless of the head against which the pump is working, or as in the extreme case of a pipe bursting, taking the head off the pump entirely. The value of this feature of the pump in keeping down power costs to the lowest point without the necessity of complicated arrangements for speed variation or cutting out impellers, will at once appeal to the manager or engineer.

With further reference to self-regulation and the turbine effect, it should be noted that the impeller becomes a pump and a turbine in series, with a pressure chamber between the two portions. The pump portion is, therefore, always discharging into a constant pressure, which is the ideal condition for a centrifugal pump, and the turbine is always discharging from a constant pressure, which is the ideal condition for a turbine.

The result of the combination just described is perfect self-regulation with the highest efficiency and, at any head lower than the normal duty, the power taken by the motor is prevented from rising.

Rees RoTURBo Characteristics

When running under a constant speed the Rees RoTURBo Pumps are designed to deliver a certain capacity against a specified head at this speed, and will give a guaranteed efficiency at that point. If required to deliver water at a higher head (and all the following calculations are based on a constant speed),



SECTION OF SINGLE-STAGE IMPELLER.

the pump will deliver against this higher head up to 115% of the designed head. The amount of water delivered will decrease as the head increases above the designed head. and the efficiency will also decrease likewise.

SINGLE-STAGE DIFFUSER.

For instance: At 106% of the designed head the pump will deliver 83% of its capacity, and the efficiency will be 95% of its guaranteed efficiency. In a similar manner: At 108% head, delivery is 73%, efficiency 90%. At 111% head, delivery is 60%, efficiency 80%. At heads above, the capacity and efficiency are not dependable, and the characteristic curves for the pump in question will have to be referred to.

For heads lower than the designed duty, the pump is more stable. For instance: for heads from 100% of the designed head down to 82% designed head, the pump will give an efficiency of 100% of that guaranteed, and the capacity at 82% is 126% of the designed.

At 69% head, the capacity is 140% and the efficiency 93%.

At 65% head, the capacity is 145% and efficiency 90%.

At 52% head, the capacity is 155% and efficiency 80%, etc., down to open valve or no head, at which point the pump will deliver in the neighborhood of 192% of the designed duty.

Due to this flat head and volume curve the efficiency of the pump is flat and varies over a wide range.

From the figures given you will note that it is best that the pump operate at heads lower than that for which it is designed. In fact, never, under any circcmstances, would it be advisable for pump to operate under conditions where the head will be higher than that for which it was designed.

It will be noticed that the efficiency of the pump remains at the highest point until the head is reduced as low as 82% of the designed head and the capacity has increased to 125%. The pump can operate very satisfactorily down to heads as low as 40% of the designed head, and at this point the efficiency will be 60% of that guarantee, and the capacity will be approximately 160% of that for which it was designed.

A fact which should be remembered is that the volume increases directly as the speed; i.e., if the speed is doubled the volume will be doubled, and at the same time the head will vary directly as the square of the speed, and the head will be quadrupled, and likewise the power will be increased in direct proportion as the curve of the speed, or as the speed doubles the power will increase as the cube of 2 or 8.

Prof. Zowski's Report on Rees RoTURBo Pumps

The following technical report of Prof. Zowski, of the University of Michigan, sets forth clearly the principles involved in the RoTURBo Pump, and will be found of interest. The accompanying curves and test cards should be of assistance in discussing the subject with consulting engineers and others.

The new hydraulic principle embodied in the Rees RoTURBo Pump is that the impeller is used to create pressure head directly, whereas in all other centrifugal pumps the impeller imparts to the water practically speed energy only, leaving it to the diffusor to turn this speed energy into pressure head, which is always a very inefficient transformation.

A chamber of relatively large volume makes up the major part of this casing. A great volume of water is dragging along, and being exposed to the centrifugal force created by rotation is converted into a sort of accumulator which feeds the discharge nozzles and is itself fed by the suction pipe.

The speed of flow in the chamber is very small and its effect upon the pressure head which is caused by rotation is, therefore, very slight. Consequently, we may vary the discharge considerably without changing the pressure conditions in the impeller to any material extent. The variations in the discharge will only change the pressure at the entrance into the diffusor, and this produces the varying pressure differences which are, of course, necessary, if different quantities of water are to pass through the same passage area.

The fact that the speed of flow in the impeller is very small, means also that the theoretical power of the pump is practically dependent only on the pressure head created in the chamber, and therefore, equally independent of the discharge as the same.

If we now succeed in designing a pump in which also the efficiency will be independent of the discharge, then it is self-evident that the variations in the discharge will not affect much the actual power which is required to drive the pump. In the Rees Pump this condition is fulfilled for the following reasons:

1st. Because the speed of flow is very small, the hydraulic loss of the impeller will be very slight as compared with the other hydraulic losses of the whole pump, and changes of speed flow caused by varying the discharge can, therefore, not affect much the total efficiency

2nd. The impeller nozzles act as turbine buckets, doing useful mechanical work by deviating the discharging water streams, and thus creating the S.C. force of reaction pressing against the buckets in the direction of rotation. This mechanical work increases with increasing discharge, and therefore, neutralizes to some extent the increase of hydraulic losses which takes place when the quantity discharged is increasing.

On the basis of what has been stated above, the following characteristics may, theoretically, be expected from the Rees Pump:

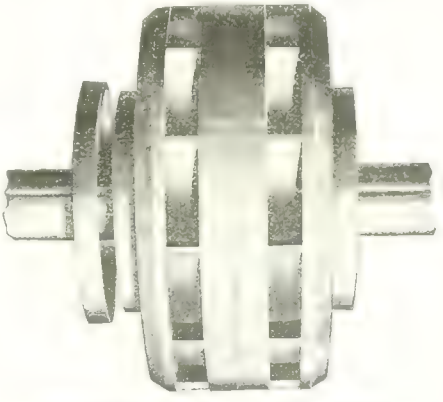
MUTI-STAGE DIFFUSER.

1st. A flat power curve with varying discharge.

2nd. A flat efficiency curve with varying discharge.

3rd. A total efficiency which must be at least as good as that of any other centrifugal pump, and which, on account of the relatively small velocities which flow through the impeller chamber, may be expected to be even better, if both are designed and built with the same amount of care and precision.

It cannot be the purpose of this report to enumerate the various instances in which this pump may be used to a greater advantage than the other centrifugal pumps, but this seems to be quite certain that the pump is ideally fitted to all services where the operation conditions are variable. Further, the peculiar construction of the impeller makes it relatively easy to use the pump as a wet compressor or as a vacuum pump, as it is a simple matter to admit the air or exhaust steam into the wide impeller chamber, and then to compress or mix it with the water in the impeller.



MULTI-STAGE P TYPE IMPELLER.

S. J. ZOWSKI.

On all pumps the casing is split horizontally so that the pump can be opened

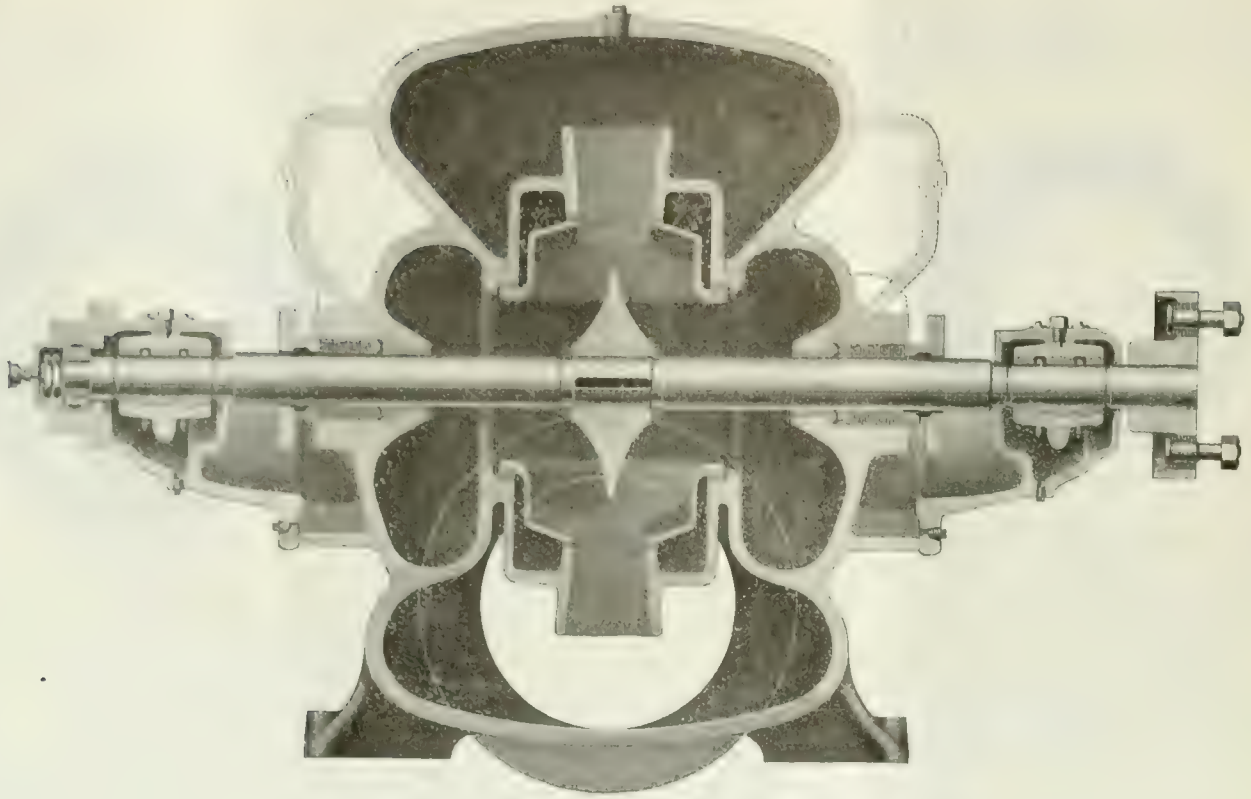


FIG. 1.—C. W. TYPE SINGLE-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

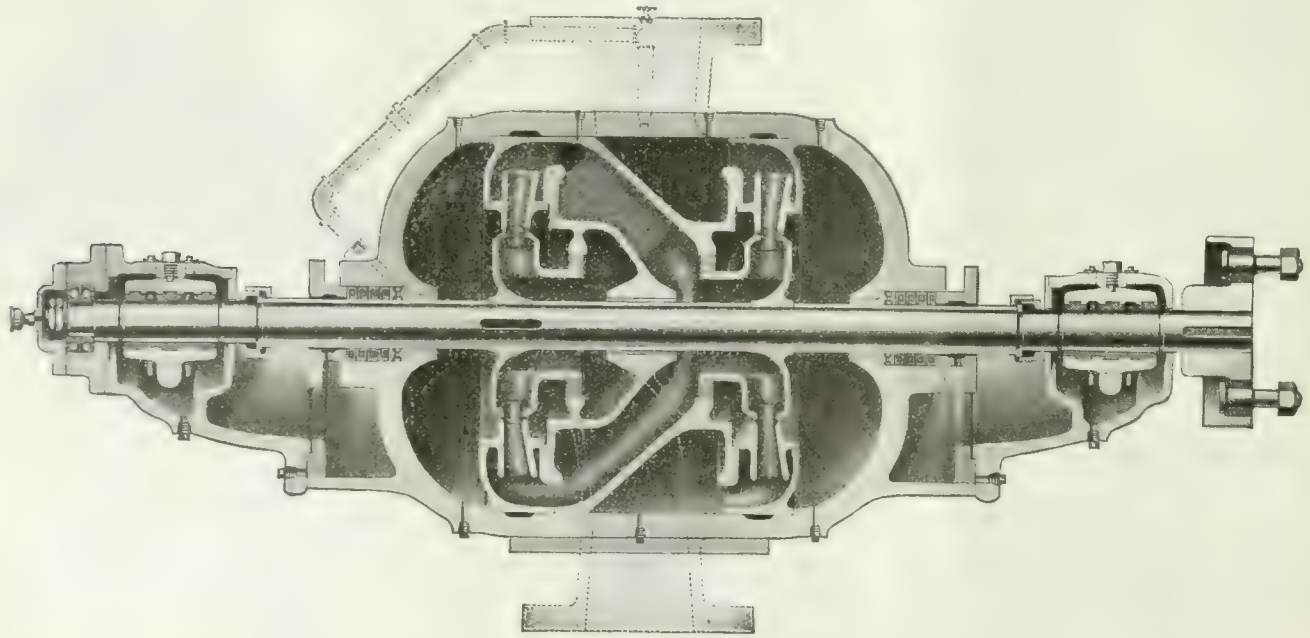
out and the internal parts examined by simply removing the top half of the casing.

It is very advisable to have both the branches, that is to say, the suction and discharge openings, in the bottom half of the casing, so that the top half can be removed without disturbing the branch connections. The standard arrangement is with both the suction and discharge branches horizontal and below the centre line of the pump. The suction branch can be made vertical if specially required. The horizontal suction branch is, however, preferred. The standard arrangement is with the discharge branch on the right hand side looking on the thrust end of the pump, but it is equally satisfactory to have it on the left hand side.

This pump may be made with either one or two main bearings. When the prime mover is supplied by another firm our practice is to fit two main bearings in all cases, but when the prime mover is supplied by ourselves, one main bearing is sufficient in the case of reciprocating engine drive and on small units with turbine drives up to moderate speeds; but in the case of high speed turbine drives (above 2200 R.P.M.) or units absorbing more than 50 H.P., two bearings should be supplied. With two main bearings a flexible coupling is used, but with only one main bearing a solid coupling is required. A brief description of the various types is given below:

C. W. Type

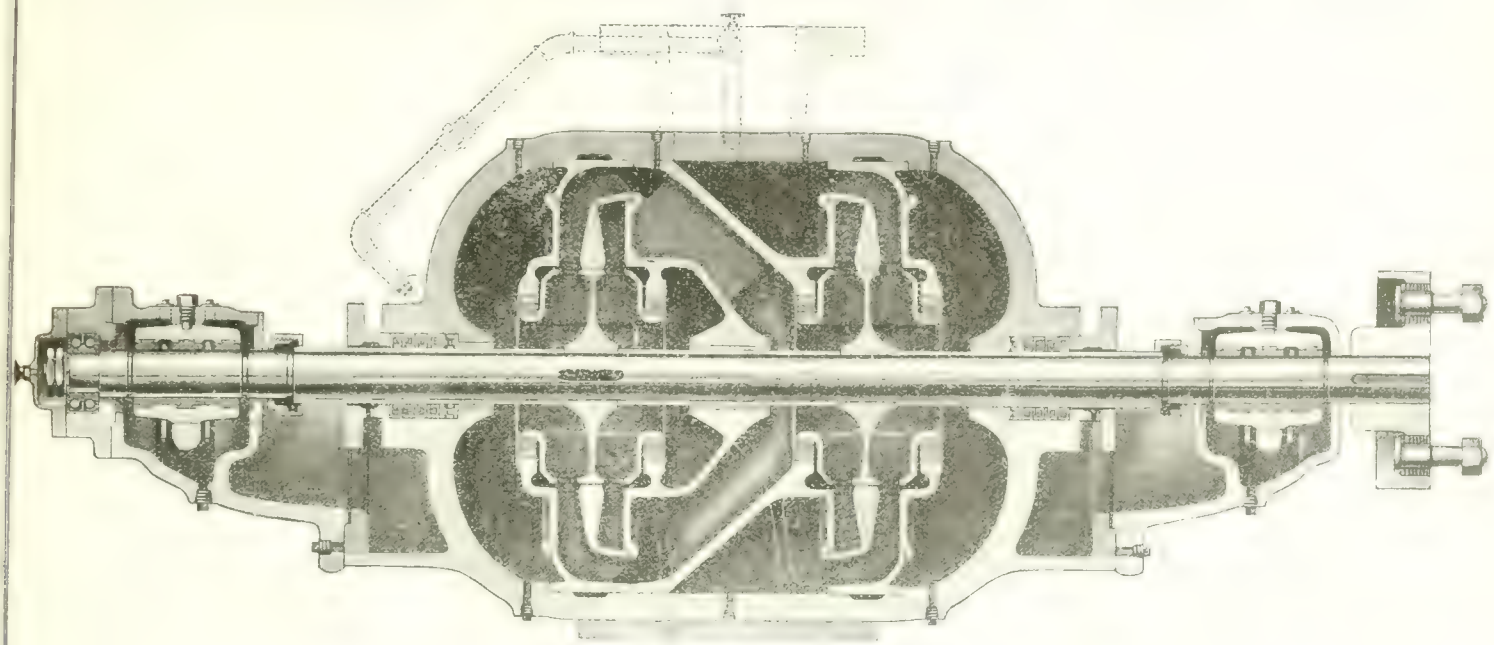
These pumps may be used for heads up to 120 feet, when the impeller is made of cast iron; double that head when it is made of bronze. It is not usually good



S2. TWO-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

practice to exceed 180 feet on a single-stage C. W. pump, unless it is of considerable capacity. Lubrication is by one or two oil rings, running over the shaft and dipping into a large reservoir beneath. This bracket also contains a two way ball thrust bearing, which acts as a centreing block for the impeller, keeping the nozzles in line with the diverging channel. In special cases the branches may be located at almost any position on the periphery of the casing to suit the convenience of the customer; but this should be avoided whenever possible, as it means special attention in designing and will probably entail delays in shipment.

The base plate is of cast iron, usually in one piece of the heavy boxed ribbed type, extended to receive the driver. For belt drive, two pedestal bearings are furnished, thus providing a bearing on each side of the pulley. Lubrication is by ring oiling. The efficiency of this pump will range from approximately 40% on a very small pump to 80% on a large one, depending entirely on the fitness of the pump in question to the service demanded of it. Efficiencies obtainable are found for any given conditions from the efficiency charts. In practice the best efficiencies are obtained with heads varying from 40 to 140 feet.



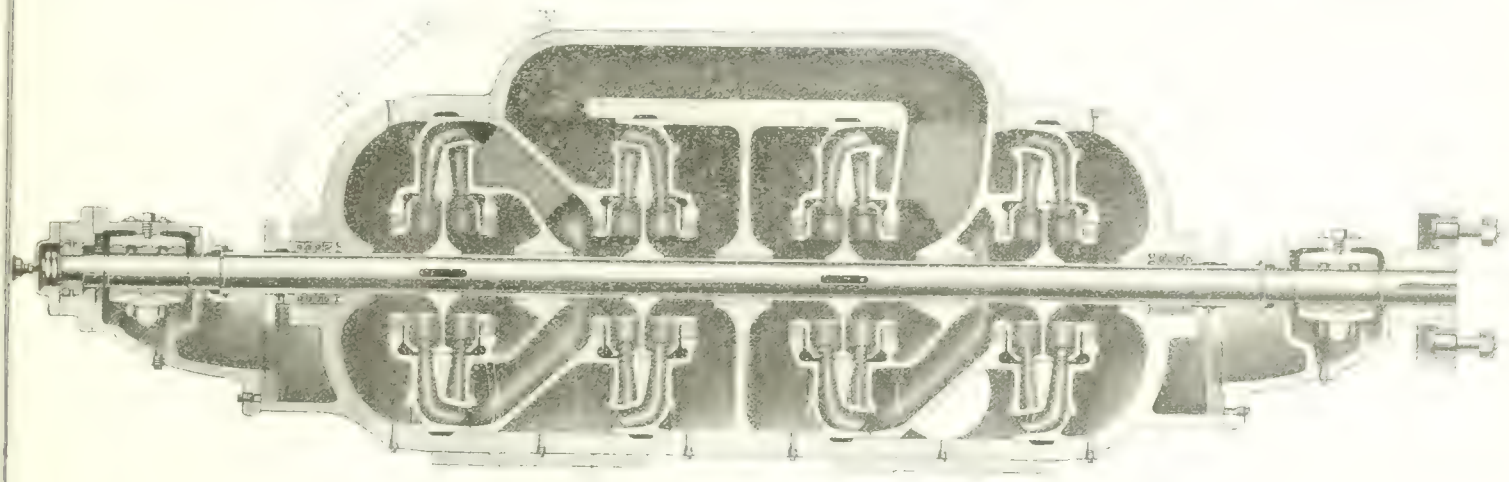
B3.—MULTI-STAGE PATENT PRESSURE CHAMBER PUMP. SECTIONAL VIEW.

S-2 Pump

This consists of two single stage, single impeller, single suction pumps, mounted on one shaft, and placed in one casing; in reality, this is two single stage pumps in one casing. The impeller differs from that employed in the C.W. Pump in that the water enters on one side or through one eye only, and therefore the capacity of an equivalent size S-2 impeller is only one-half that of a C.W. type of pump of the same diameter, the capacity limit of the impeller being based on the velocity of water through the eye. The impellers in these pumps, when mounted on the shaft face to face, are so arranged that water under pressure flows to the back of them, thus hydraulically balancing them with regard to end pressure. The diffusors of these pumps are two in number, and are of the straight way type similar internally to those used on the C.W Pump. What has already been said about number and type of bearings for previous pump, is also applicable to the S-2 Pump.

B Type Pump

This type of pump is one which is particularly well adapted for exacting service. It has many advantages over



B4.—EIGHT-STAGE PATENT PRESSURE CHAMBER PUMP. SECTIONAL VIEW.

the ordinary centrifugal pump besides the special feature of the capacity chambers. It is multi-stage built in multiples of four, and not otherwise. The impeller is of the two stage type, each impeller having two stages back to back with an eye on both sides. This is a mechanical advantage in that it shortens the length of the pump, and consequently the distance between bearings. The arrangement of the stages in multiples of four only, is clearly explained by reference to the method of obtaining hydraulic balance. This hydraulic balance is not only theoretically perfect but is actually so. This can easily be proven by the fact that on pumps up to 16 stages and more, a standard type of ball thrust bearing is used for the centreing block instead of the usual type of collar, water cooled marine thrust bearing, used by other pump manufacturers to take up end thrust. The end thrust experienced in RoTURBo Pumps is practically negligible. The purpose of the ball thrust used is to keep the impeller in line with the diffusors. The compactness of the pumps is further facilitated by the use of cross over diffusors. These diffusors are two combined in one, and cross the water from one stage of the pump to the next, and in this way (the water being crossed in a correct manner from one stage to the next) the pump is balanced with reference to end pressure. B types of pumps usually contain two bearings, both external to the casing, supported in brackets from each end of the pump. These are the same as those used in the other pumps, and are lubricated by means of two rings to each bearing dipping into a large reservoir of oil beneath, which has an overflow and drain. Above each stage of a B type pump is a relief or pet cock, its purpose being to relieve the entrapped air. B & S types of pumps have bronze covered shaft; the other type of pumps have steel shaft unless bronze is specified, which will be special and for which an extra charge will be made. B type pumps are used for heads from 100 to 1,600 feet. Their efficiencies are found from the efficiency charts. Given the volume and head per stage on the pump the best efficiencies are obtained with heads of from 40 to 140 feet per stage.

The makers of these pumps claim the following features and advantages derived from their pumps, namely that:

1. A drooping power curve, i.e., a power curve which rises not more than 10% as the volume is increased beyond the designed duty point and falls away as the volume is still further increased, thus making it impossible to impose an overload on the motor or turbine which may be used for drive.

2. High and permanent efficiency maintained over a very wide range of heads and volumes, i.e., a flat efficiency curve.

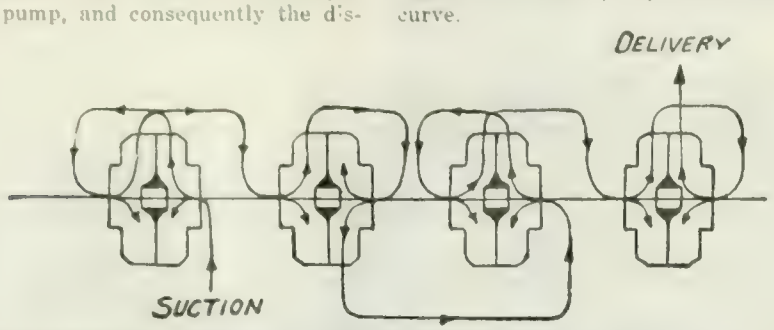


DIAGRAM SHOWING FLOW AND HYDRAULIC BALANCE OF A BI EIGHT-STAGE PUMP

3. A head and volume curve which goes out to approximately 200% of the volume at the designed duty point when delivering against no head, in other words, maximum increase in volume at reduced heads. This is a great advantage for many purposes.

4. Owing to the low water velocity through the impeller and stationary passages, there is almost complete freedom from wear, even when pumping gritty water. This forms a marked contrast to the ordinary centrifugal pump, where facilities have to be provided for the renewal of blade tips and other parts, due to the excessive erosion. With much wear, of course, in pumps of such construction, the efficiency falls rapidly.

5. An outstanding feature of the Rees RoTURBo Pump is that both single and multi-stage pumps are in perfect hydraulic balance, thus eliminating the expensive marine thrust bearings and balancing pistons which are always liable to wear and give trouble as soon as the clearances of same become worn through pumping gritty water. A small two-way ball thrust is usually fitted, the function of which is merely that of a centreing block to maintain alignment between the impeller and the diffusors.

6. The strong and rugged design of the impeller, diffusors and casing insures complete freedom from noise and vibration.

7. The pump is especially suitable for use with liquid of a gritty or viscous nature, owing to the low velocity through the impeller and casing, and has been largely used for pumping thick oil, sugar, liquids, etc.

8. From a mechanical point of view the pump is fully standardized and all wearing parts are easily replaceable, being made to gauge and kept in stock, thus permitting quick shipments on receipts of orders for repairs. The design of the pump is specially adapted for a wide range of duties with a given pattern by small alterations, thus reducing the number of patterns carried to a minimum and enabling us to completely standardize all parts.

From the foregoing history, and detailed description of these pumps, it will be noted that efficiency is a very strong feature. To class them as a centrifugal pump only is a huge mistake, for they combine, as the trade-mark RoTURBo infers, a rotary, turbine effect, and not simply a centrifugal pump effect. Perhaps the most interesting portion of this article follows, namely, that these pumps are now being built in Canada, by the Goldie McCulloch Co., Limited, of Galt, Ont., who have secured the sole rights for these pumps in the Dominion of Canada. For the past seventy years this firm has specialized in the production of high grade power equipment, so it is hardly necessary to mention that they are in splendid shape to manufacture work of this kind. The various photographs accompanying this article can be easily understood from the descriptive matter in the body of the article, and to aid readers to pick out the various types, titles are placed under each photograph. This firm when speaking with the representative of CANADIAN MACHINERY mentioned that they were only too pleased to answer enquiries relative to these pumps, and that such information in catalogue form was to be had for the asking.

A. R. Roberts, formerly if Burns & Roberts, Ltd., Toronto, has discontinued his connection with the firm, and has opened an office at 201 Bank of Hamilton Building, Toronto. He will deal in new and used machinery, contractors' railway and power plant equipment.

ACKNOWLEDGMENT

The following firms were good enough to supply us with the photographs, etc., illustrating article on shop transportation in our last issue:—

Herbert Morris Crane Works, Niagara Falls, Ont.

Equipment Mfg. Co., Cleveland, Ohio (Griswold & Hammond are their advertising representatives, Cleveland, Ohio).

Jeffery Mfg. Co., Columbus, Ohio.

Northern Crane Works, Walkerville, Ont.

General Electric Co., Schenectady, N.Y.

Curtis Pneumatic Machinery Co., St. Louis, Mo.

The Electric Storage Battery Co., Philadelphia, Pa.

The Cowan Truck Co., Holyoke, Mass.

The Lamson Co., Boston, Mass., (Jones & Glassco are their advertising representatives, Montreal, Canada.)

Cheese Factory Boiler Explodes at Joyceville

Little Village Near Kingston is Scene of Disastrous Explosion—Boiler Ruptures Along Longitudinal Seam, Which Was Badly Corroded—No Inspection Had Been Made on This Boiler Since Installation

T. H. FENNER, Associate Editor Canadian Machinery

THE question of the adequate and regular inspection of steam boilers is once more brought to the public mind in a way that defies evasion. Once again a boiler in an industrial plant has exploded without a minute's warning, leaving in its trail a wrecked building, and worse still, destroying two human lives. Both the victims were young men, with many years of life in front of them under ordinary circumstances.

The boiler in question was in use at the cheese factory of Thomas Anglin, of Joyceville, and was of the horizontal return tubular type, about 38 inches diameter. It was similar to most of the cheese factory boilers, of which there are no less than one thousand and forty, known and listed in the Factory Inspection Department. There are probably many more than this in use, for it is a difficult matter to keep track of these boilers. Under the Factory Act, steam boilers in use on farms, or for general agricultural purposes, are exempt from inspection. Cheese factory boilers were at one time also exempted, but for some years past they have been brought within the law.

The original thickness of the plate was ¼ inch, and the boiler was made up of two sheets, the longitudinal seam being single riveted. We have no particulars of the pitch, but with a joint of this kind the percentage of strength to the solid is approximately 50 to 54. On this assumption the resistance of the shell to internal bursting force would be, with a factor safety of 5, about 70 lbs. if made of steel. This, if the boiler was in good condition, which it was not.

Some interesting statements were made at the coroners' inquest relative to the operation of the boiler. It had been installed in 1915, having previously been in operation for some time. The owner was supposed to have notified the Steam Boiler Department at that time, but presumably was not aware of this. It was not until two years after that he received a circular from the Factory Inspection Department, notifying him that an inspection was necessary. He then called in a local firm, who made a repair by patching the boiler. The repair people undertook to notify the Inspection Department, and apparently did so. The inspection was not made for reasons given later in this article. The owner thereupon let things slide, evidently believing it was no affair of his. He continued using the boiler, and finding that the safety valve opened at about 40 lbs. pressure, hung some more weights on the lever, to bring the pressure up to 80 lbs. It was stated that the boiler actually blew off at 100 lbs. per square inch. At the time of the explosion, the pressure was stated by Edward Gallery, the cheesemaker, to be between 80 and 100 lbs.

This man was presumably the operator of the boiler. He had received some instruction in boiler operation while taking his course for cheesemaking. He was not aware that any inspection was necessary, and stated that he never heard of inspections being made in other cheese factories.

Here we have the two men most interested in the boiler, one the owner and one the operator. The owner knew that the boiler should be inspected, but, when the inspection did not materialize, took no steps to find out why. The other man had no idea that the boiler needed inspection, and cheerfully went on operating without the slightest conception of the danger he was running. When the catastrophe took place, it was two men who were not even employed at the factory who were killed. There is an instance of fate's irony.

The provincial inspector, who made an examination of the remains of the boiler after the accident, found evidence of deep corrosion on the seam where the rupture took place. The plate was grooved until a bare one-sixteenth of an inch thick. He stated that the boiler was poorly built, and when new would have been good for only 54 lbs. per square inch. If it had been inspected by him he would have condemned it, or allowed only 15 lbs. per square inch.

Two weights were found which had been on the safety valve lever. Had they been at the end of the lever it would have required a steam pressure of 200 lbs. per square inch to raise the valve. The steam gauge, never having been tested, may have been considerably out, and probably was.

Here is a case where, had the inspection been made, the accident would have been prevented. The reason given for not making the inspection is a shortage of inspectors, there being only six for the whole province of Ontario. In the case of cheese factory boilers, the difficulty of inspection is enhanced by the out-of-the-way localities they are usually placed in. This makes the inspection a matter of a whole day in some cases, and when the number of boilers are considered, it is quite to be understood that some of them are missed. There are many owners of boilers who take no interest in the safety of their property, either through ignorance, or a desire to save the fees. There is a great need of a means to enforce the laws already in existence. In this connection a good plan has been suggested. It is that instead of having the inspectors all atttached o the central office, the province should be divided into districts, with a resident inspector in each. This inspector would know the district and everybody in it, and the possibility of a boiler being operated without inspection would be reduced to a minimum.

It would also prevent a thing that frequently happens now. A man has a boiler on his farm which comes under the agricultural classification and is, therefore, exempt from taxation. He takes up cheese manufacturing, or starts a sawmill, and the boiler is then, of course, in commercial use, and liable to inspection. If the owner himself does not notify the Factory Department of the change, it is quite probable that under the existing conditions he may operate it for one or two years before anything is known about it. Resident inspectors would know of a case of this sort immediately.

The Case of the Farmer's Boiler

This brings us to another consideration. Why should any steam boiler be exempt from inspection merely because it is not used for commercial purposes? A farmer who uses a threshing engine, or steam tractor, is not compelled to have it inspected.

The viewpoint of the Legislature is presumably that a man using a boiler on his own land for what may be reckoned as purely domestic purposes, should not be bothered with inconvenience of Government supervision.

Speaking generally, the less the Government interferes with private enterprise, the better; but here is a case where it is in the interest of the man himself to interfere. The law puts effective checks in the way of the purchaser of poison, even if only to kill vermin, or a dog who has had his day. It should do the same with such a highly dangerous instrument as a steam boiler.

There is a very wide spread fallacy among small steam users that because a boiler is comparatively small and operating at low pressure it can't do much damage anyway. They are partly right. A 30 inch diameter boiler operating at 100 lbs. pressure is not so dangerous as a 60 inch boiler operating at 50 lbs. pressure, but it is dangerous enough. The explosive force of a boiler lies not in the pressure it carries, but in the heat energy contained in the water. The greater the weight of water, the greater the damage that will be done. This

Continued on page 61

Interesting Thermit Weld to Crank Shaft

By J. R. RODGERS

THERMIT welding is now recognized as a most effective and economic means of repairs to equipment and heavy parts of machinery, particularly of the heavier variety where great difficulty would be experienced with the other methods of repair. The illustrations on this page show the various stages in a repair to a two throw crankshaft taken from a high speed paper machine in one of the large pulp and paper mills. The estimated loss to the plant by the break of this shaft was approximately $200 per hour, so it was essential that operations be delayed as brief a period as possible. The shaft was removed from the machine and expressed to Montreal, where the St. Lawrence Welding Co. effected the repair by thermit welding. The time required to make the weld, after the shaft was received in the shop, was about 30 hours. This included the alignment of the shaft and clamping in position on the floor plate, the construction of the mold, the pre-heating period of 7 hours, and the actual weld, the latter only occupying a few seconds.

In setting up work of this character it is always necessary to allow for the shrinkage of the metal as the weld cools off. The two parts being completely separated by the break and the portion cut away, there is no lengthening of the shaft during the pre-heating period, so that the contraction after welding must be carefully calculated when setting up the work. After the repair it was found that the error of alignment and concentricity was less than 1/200 of an inch. The machining was completed by the Hydraulic Machinery Company in about 20 hours, and the shaft returned to the mill in less than four days from the time of the break, so that the operations were resumed at the mill with the minimum degree of shutdown. The shaft was over 14 feet in length with diameters ranging from 6 to 8 inches, cranks being 5¼ inches in diameter. The break took place close to the web of one of the cranks, as seen in the cuts herewith.

FIG. 1—ALIGNMENT OF SHAFT BEFORE SETTING THE MOLD.

FIG. 3 WELDED SHAFT AFTER MOLD IS REMOVED, SHOWING RISER AND GATE IN POSITION

FIG. 2—PREHEATING WITH MOLD IN POSITION.

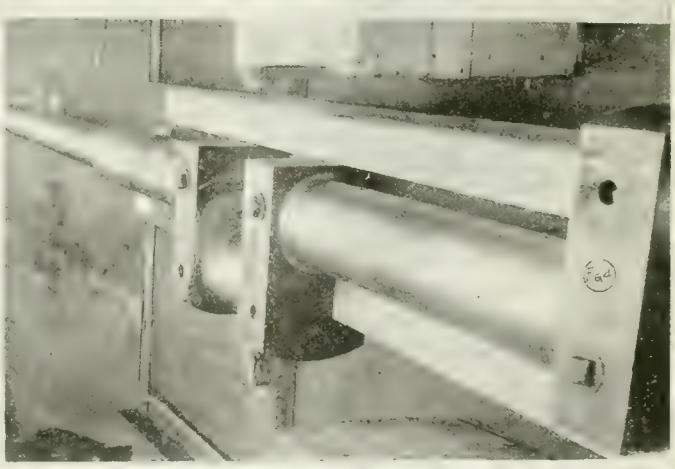


FIG. 4—COMPLETE REPAIR AFTER MACHINING.

TICKLISH TUNNELING UNDER THE EAST RIVER

A very interesting bit of tunneling was recently done on the 14th Street tube under the East River, New York. The heading was being run in rock, and at one point test holes showed a thickness of only eight inches of sound dry rock above the line along which the top of the tunnel was to run. As the tunnel was being driven without the use of compressed air it was decided to drop the upper heading four feet until this thin cover of rock was passed. The cast iron lining was set in place at each side of this section and then the rock was removed very carefully by using a great many holes, each loaded with about one-eighth of a stick of dynamite. As each bit of rock was removed to the arch the tunnel lining was set in place. By this means the dangerous section was tunneled without breaking through the thin shell.

Commercial developments by air are rapidly taking a tangible form. This is shown in the active interest taken by the aviation department of Vickers Limited, of England, and the request that has been forwarded to this company by the Chamber of Commerce and the Aero Club of Atlantic City, N.J., to seriously consider the city as the Atlantic terminal for any commercial route that may be established. It is believed that the American agents of Vickers are even now studying the advisability of making this port the western terminus of a proposed transatlantic route for air tourists.

THE ZEUS ARC WELDER

ELECTRIC arc welding of the past has been thought of in the light of large cumbersome installation of considerable cost. It has further been understood that since it consists of a motor generator set entailing moving parts, there might be some difficulty in connection with its operation from time to time. It has always been understood to be inefficient on cast iron and in connection with overhead welding.

This new arc welder, manufactured by the Gibb Instrument Company, of Detroit, Michigan, is built of an entirely different type. The motor generator set with its disadvantages of bulk and moving parts, has been supplanted by a simple transformer with no moving parts, and like all transformers with nothing to get out of order. It has been found that the current consumption is from twenty to forty per cent. less than the motor generator type. One big feature is its adaptability to overhead welding, which class of welding has given considerable trouble in the past with the arc welding equipment. It has further been found to be particularly efficient in the welding of cast iron, which has been another difficulty in the way of the unqualified success of the types of the past.

This welder is comparatively small, making it unnecessary to set aside expensive space for its accommodation. Further, because of its convenient size, it is portable.

The "Z E U S" is built on a unit system, whereby a concern may install a 150 ampere machine, and when the work becomes heavier, a duplicate may be connected in parallel with the original machine.

FIG. 1.—GENERAL VIEW OF THE APPARATUS.

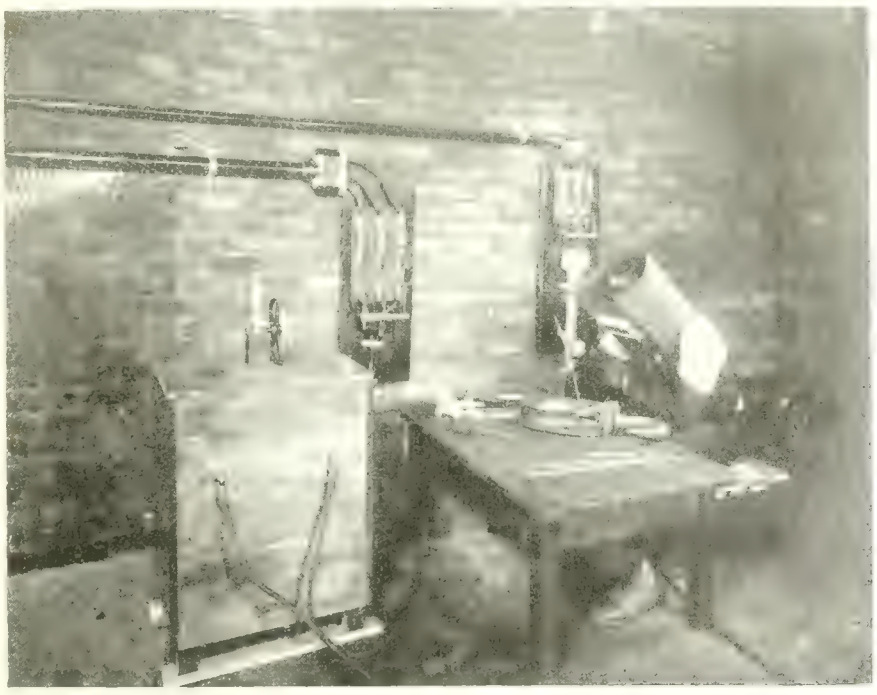


FIG. 2.—THE OPERATOR AT WORK.

One of the outstanding features of this welder is its arrangement for regulation. It is not necessary to in any way, change the connections in the regulation of the arc. A wheel connected with the secondary and extending through the top of the case, raises and lowers the secondary and provides for the regulation of the current necessary for different sizes of electrodes.

The inherent reactance of the "Z E U S" welder automatically stabilizes the arc for different arc lengths.

In addition to all its advantages, its cost is considerably lower than the cost of the types of the past.

Different methods are in use for keeping the supply of electricity steady in spite of the varying demands made on it. In some systems of distribution, instead of the two main conductors being one positive and the other negative, each is positive and negative alternately, the reversals taking place some hundreds of times a second. The current is then said to be alternating. When such reversals do not take place the currents are said to be direct.

Are Accidents Merely an Unnecessary Evil

Industrial Accidents Cost America 35,000 Human Lives and More Than $500,000,000 Annually—Is Such a Condition Necessary, or is a Large Percentage Due to Utter Carelessness?

By Master Mechanic

THE prevention of industrial accidents is a subject that at last is receiving the attention it so richly deserves. Although safety methods have been installed in various shops and factories throughout the country, still it is only in the last few years that any real systematic attempt has been made to reduce the accident bugbear.

There has been unfortunately a general fallacy existing that all work accidents were necessarily incident to industry, and that casualties were inevitable. How completely incorrect this assumption is, has been proved beyond the shadow of a doubt, by the splendid success in reducing accidents achieved by various safety engineers, and large industrial companies who have systematically attacked this accident problem.

Can We Prevent Accidents?

Not only has it been shown that accidents are preventable, but also that this prevention is not only profitable, but humane.

In 1916, there appeared an estimate of killed and wounded, which quoted the fact that the annual loss that year alone was greater than the combined losses of the Union and Confederate armies during the Civil War.

These figures cannot help but prompt the question: "Why so many accidents—were they all unavoidable?" which brings us up to a point where discussion is possible.

Accidents **can often** be avoided by exercising a little care and forethought.

An outstanding example is the Power Press. This machine was responsible, year after year, for the maiming of thousands of unfortunates, and the position of press operators was a hazardous one.

The same conditions exist in many "Safety First" campaign in motion.

At the present time in any up-to-date press room, it is the operator's own fault, and due to rank carelessness, should he lose a finger, for preventative guards of all descriptions have been installed for his benefit.

The same conditions exist in many other plants engaged in other lines of business, but for the purpose of this article, and to prove how carelessness is ofttimes the cause of accidents, let me mention a number of cases which have been cussed and discussed by the various parties concerned.

Some Examples

Let us start out with a very common form of carelessness, and the cause of many an accident—usually slight.

Did you ever see the tang of a file sticking out of the bench drawer(?). Of course you have, for unfortunately it's a common sight in the average machine shop. Usually a man opens the drawer hurriedly, slams in the file, and there you are. The handle sometimes stays on, sometimes not, then again often there was no handle on it at first. Someone comes along and without thought attempts to push it in the remainder of the distance, result—one more accident, usually slight, but in one case which came to the writer's attention, the outcome was blood-poisoning of very bad nature. Here is one case where a little care would make such an accident a thing of the past.

Then there is the chap up on the scaffold or platform, who will persist in leaving his hammer, chisel, wrench or some such article, just balancing on the edge. A slight vibration and down it comes, usually on somebody's head, sometimes luckily in such a way as to merely leave a bump, but often the victim receives a mark he never gets rid of. Here again, rank carelessness is the reason, and yet preach, preach, preach as you like, the same old condition continues to exist.

Oh, I Never Thought

Have you ever run across the type of workman who never bothers looking to see if there is any reason why he should not do the particular work he intended(?) The incident I have in mind was in connection with a boiler.

There was an inspector in the boiler, and on the job, watching him carefully from the outside, was the engineer. Naturally the engineer was very much interested to know what report the inspector would make, and on hearing a muffled remark from inside to the effect that his valve on top was leaking slightly he went up and without thinking(?) turned it the wrong way. Luckily he had presence of mind enough to realize what he had done and shut it off at once. Out came a badly scared and badly burned inspector. Here was a case where a locked valve would have been a real blessing. There is such an article on the market, which not only locks the valve, but has a tag which says, "Danger—man in boiler," yet here we have a case where no doubt the fact that such a thing existed was unknown. Was this accident unnecessary? We should say yes!

Don't Take the Short Cut

In a certain plant where safety first was believed in there was a sign as follows: "Never crawl through, over or under a belt." This sign was rather necessary, for there was one belt in particular, a 12 in. wide belt, which ran a pulp mill, and which ran over a space about three feet wide, a real nice short cut if you liked to take the chance. The belt was held together by a series of fasteners which protruded considerably on the side of the belt.

One chap in particular couldn't see the sense of this sign and kept on taking the short cut. He was warned, in fact threatened, but to no avail. He happened to be assistant superintendent or otherwise he would have been fired. Nobody seemed to think of blocking the path up with a real suitable guard. "You'll not bend enough some day," this fellow was told, and one day he didn't. When they picked him up he was dead, with his head practically torn in two.

And then, strange to state, a guard went up. What is the answer?

It's a strange fact that in spite of these different accidents, you will find the fellow who feels sure he's all right. He will usually tell you he has done this for the last five years and never got hurt, so why change his method now?

A case of this nature is well worth repeating.

This fellow was employed to attend to the oiling of all shafting in the plant under discussion. He was, to give him justice, an adept at handling a ladder, and so on safety feet for his ladder being suggested he pooh-poohed the idea. "What, me put those non-slips on the foot of my ladder, well I should say not."

However, time will tell, and on this particular day his ladder slipped. With great presence of mind he grabbed the shafting and hung on as best he could. Right below him was a paint mixer with its gears noisily letting him know they were very much there. It was not long before someone shut off the power and helped the victim of the accident down to terra firma once more.

His hands were badly lacerated and his nerve was badly shaken, and, what is more, he came down a convert to safety methods. His ladder received feet of the best non-slip variety, furthermore he exercised more care than ever before in the carrying out of his duty.

It may seem to the reader at this point that here we are croaking of all these accidents and mentioning only the gruesome cases, never touching on the lighter (?) side of trouble, but to illustrate that it is not the intention to show only the horrors of the situation let me quote a real funny incident that occurred some time ago in a machine shop in which the writer happened to be at the time.

Owing to bad judgment in the placing

of machines there were, strange to state, two planers in such a position that their tables ran in similar direction. It had never been considered possible that these tables could nearly meet if out at full extreme of stroke, but as luck would have it, one chap found this fact out, for in passing between these machines in an offhand manner he was pinned between the two tables. It looked mightily like a serious accident for a moment, but luckily the tables had reached the very maximum point of their strokes. Of course the yells of the victim could be heard for blocks, but he was more scared than hurt. All he really got was a steady squeeze, but he never takes short cuts any more, and these machines are now arranged in a different manner.

To show how similar cases have different results, let us quote another planer incident with an entirely different ending. The machines concerned in this case were a lathe and a planer, these being so arranged that often the space between the end of the lathe bed and planer table was very small. One day a workman was jammed in this space, and unfortunately so hard that he died inside an hour. Of course as per usual the stable was locked after the horse had left, for immediately after this accident the position of these machines was changed.

The Use of the Crowbar

A crowbar, like any other tool, has its own particular use, and this use is certainly not to pry around the flywheel of an engine under steam. Yet how often we see workmen using a bar under these conditions.

One incident that comes to the writer's mind is that of the attempt to start a huge hydraulic pump by means of a crowbar. "Did you close that throttle valve?" was the first question asked of the engineer before commencing operations. "Sure," came the answer back, and so the crowbar was inserted. But not for long, for suddenly wtihout warning, crowbar and men went off at a tangent to the flywheel at what a youngster would describe as some speed. Of course the reason is apparent, for although it was thought that the throttle valve was closed, still results proved it was only partially closed. Luckily nobody was hurt, merely badly shaken up, still, crowbars are not used for such purpose in this engine room at least.

Emergency Elevator

It is sometimes the most foolish idea that workmen will follow out, as for example the following incident.

It was desired to hoist a heavy casting, too large for the elevator, up to the fourth floor. The only solution was to knock out a small section of the outside wall and hoist up to this point. One fellow thought out the brilliant plan of using the shafting on the fourth floor as an elevator, so he wound the rope round the shaft and gave orders to start the motor. He omitted, however, to notice a loose loop of rope which caught his foot when the motor started, with the result that it carried him up to the shaft, and before they could stop the motor he was dead.

But these stories of lack of thought could go on indefinitely, for case after case has no doubt cropped up in readers' minds while they have been perusing this article, so, with a closing example, the writer will close.

This incident happened in quite a large manufacturing concern where there were men who were paid high salaries to know better, and they did no doubt realize that the scheme adopted was a risky one—but to go on with the story.

They were moving a large motor down an incline of about 25 degrees. This motor was of such width that all the weight would rest on two boards of the portion on which the same had to slide, so for safety's sake it was deemed wise to place crosswise on this boarded incline two large doors on which to slide the motor, this of course distributing the weight evenly.

All went fine, and the motor was coming down in splendid shape. Only 4 feet more was necessary to bring it to the level, and it seemed a shame and a waste of good time to move and place a door under the motor for such a small distance. It was suggested that they take a chance (I use the term advisedly) and skid her down without the aid of the door.

They tried to do so, and as soon as she came off the door one of the feet plunked through the board, the motor swayed with the impact and toppled over sideways on to the cement below and smashed some parts of it, which took over two weeks to replace.

Of course there were some men lost their jobs over this incident, but that didn't help the motor any. Here we have a plain case of foolishly taking a chance in order to save a few moments' time.

It is this fact of rush, rush, rush, that causes so many accidents. As readers have no doubt read elsewhere, the A B C of safety first is, "Always be careful," so when tempted to rush matters, think of these three words and be careful rather than sorry.

The final question is this: "Are accidents absolutely necessary, or are a great percentage due to carelessness and lack of thought as described in the previous examples?" at which point the writer leaves readers to their own thoughts on the subject.

GUNPOWDER SAVES

A somewhat novel idea is in successful operation in the machine shops of the D. & H. R. R. Co., at Watervliet, N.Y. They are using ordinary black sporting powder to save the time of mechanics as described below:

Used for blowing nuts and bolts (sweated on) of which there are many in the construction of locomotives and other railroad equipment.

Breaking up iron and steel to be scrapped.

Forcing off a piston (locomotive) when rust or corrosion binds it.

Breaking metal which has become cold in a furnace (this has been done at this plant without breaking a firebrick).

Methods of Use

The charge of powder in all cases is loaded in steel guns of various sizes and held by a steel plunger, which is forced out when the charge is set off. No wad is used. The plunger is milled to a size to fit (easily) the bore of the gun.

They have these guns in sizes, from end to end, of 5 to 12 inches, with other dimensions in proportion; also dimensions for plunger to sink. Some of the gunbarrels are milled in the shape of an octagonal prism instead of being cylindrical; the bore in all cases is round.

The gun, after loading, is jacked up with the mouth within about one inch of the object to be struck by the plunger, and fired. They use approximately 1 oz. of powder per nut or bolt (sizes in common use on locomotive construction) which is to be broken off or loosened. The load, of course, is varied with the work to be done. I mention the amount for bolts and nuts because this is the commonest practice with the gun.

By the use of these guns, they claim, much time and labor has been saved; also, a sharp, quick blow can be directed at an object which is barely reachable otherwise.

BOILER EXPLODES AT JOYCEVILLE

Continued from page 157

Joyceville boiler was of the kind usually reckoned by the farmer class to be without possibilities of danger. The accident clearly shows what a small boiler can do if it explodes.

The Remedy

The remedy is so obvious that it hardly needs suggesting. It is the plain duty of the Government to put its inspection departments on a basis that will enable them to keep track of every steam boiler in the province. Where there is danger to life, petty economies should not be considered. Five or six inspectors for a province the size of Ontario are hopelessly inadequate, and it is to be earnestly hoped that steps will be taken before any more fatalities occur

Accidents in the iron and steel industry have decreased by more than two-thirds during the past 10 years as a result of the movement to enforce safety regulations, according to a report recently made by the Bureau of Labor Statistics. In 1907, the report shows, 245 men were killed or injured out of every 1,000 employed, while in 1917 the accident rate was reduced to 81 per 1,000. A further reduction would have been recorded in 1917 but for the dislocation of industrial processes to meet war needs, the report adds. The majority of accidents are declared to have resulted from defective machinery and the employment of inexperienced men.

WHAT OUR READERS THINK AND DO

RADIAL BORING FIXTURE

By J. J. McIntyre

MACHINING operations out of the ordinary are not plentiful, but the method described here for boring "round a corner" is away from the "beaten path."

The Lamson Conveyor Co., of Lowell, Mass., makes conveyor systems for carrying mail through underground tubes at Washington, D.C.

These tubes are 8 in. in diameter in the bore. All right angle turns are made on an 8-foot radius. It is the boring of these sections that the turn makes necessary that the attached sketches explain.

Fig. 1 gives the requirements that have to be met. Each section, of which there are four, comprises an arc of a little over 3 feet in length. Each section must be bored smooth on an 8-foot radius so that the mail carrier will not get stuck when it shoots around the corner.

After the four sections are bored they are drilled for bolt holes on the flanges and are later secured by bolts when assembled.

The ingenious set up represented by sketch Fig. 2 and attached photograph will help to make the method understandable.

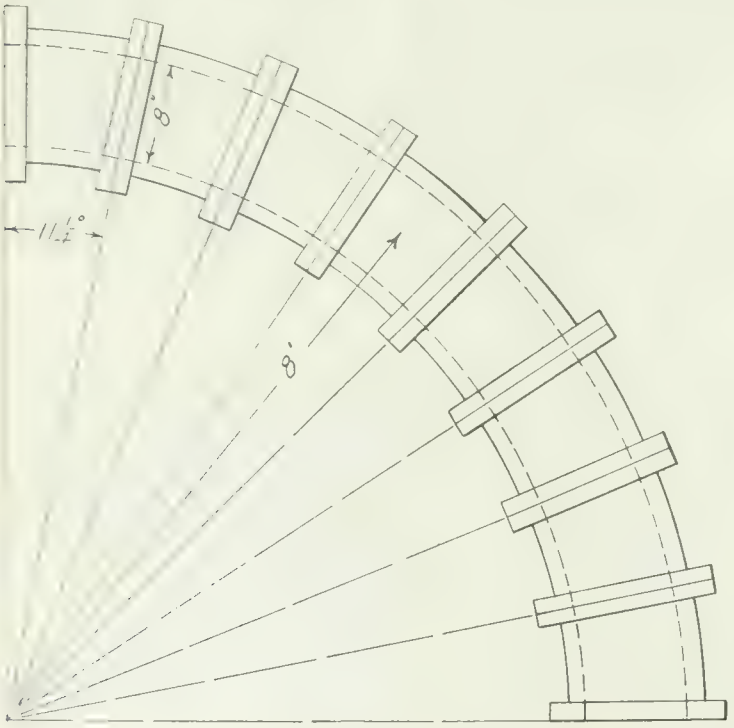
The method involved is that of machining Stephenson locomotive links applied to a horizontal boring mill.

The work-holding cradle is made to pass by the revolving cutter head on an 8 ft. radius by the aid of the longitudinal feed of work table which is free to move at right angles to spindle of machine—the crossfeed nut is removed to permit this.

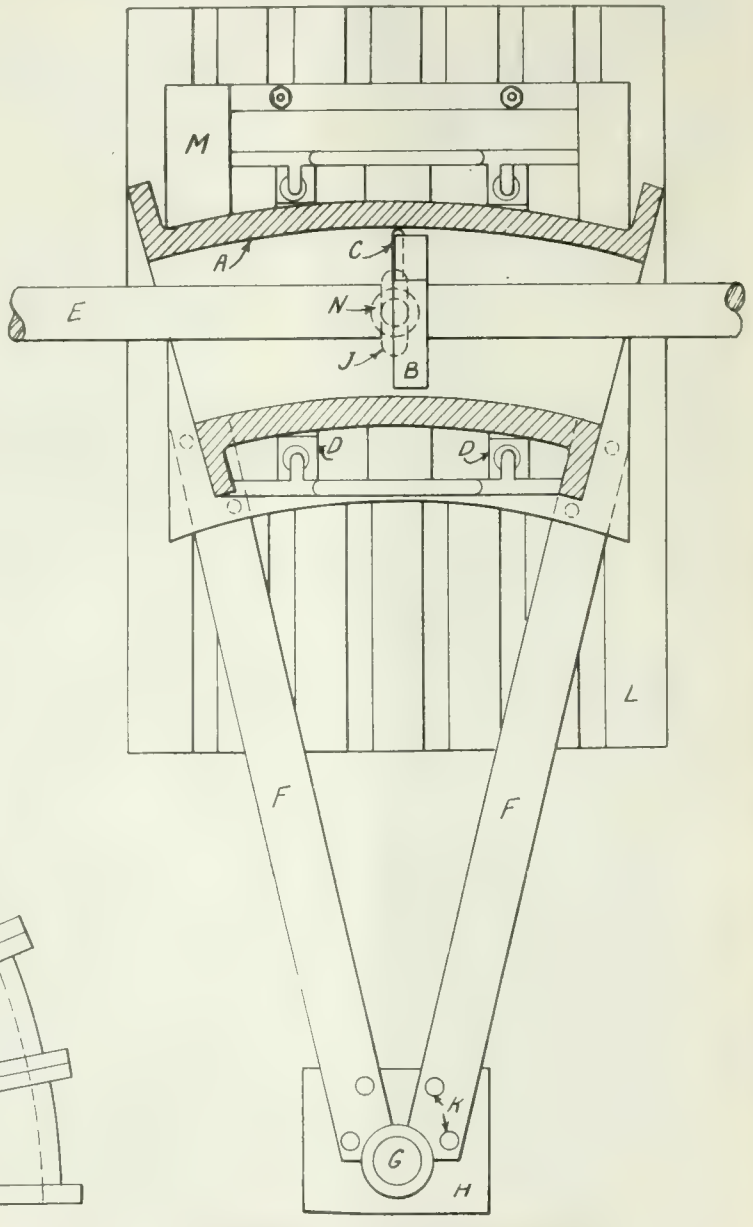
The two stops D hold the work A in the cradle. The cutter holder can be pinned or held by screws on shaft E.

Boring around a corner becomes a reality when the procedure described here is followed out.

When this operation was first proposed it was declared to be impossible of execution; however, the design proved workable and the above concern has accomplished the machining of a great variety of radii and different sized bores.



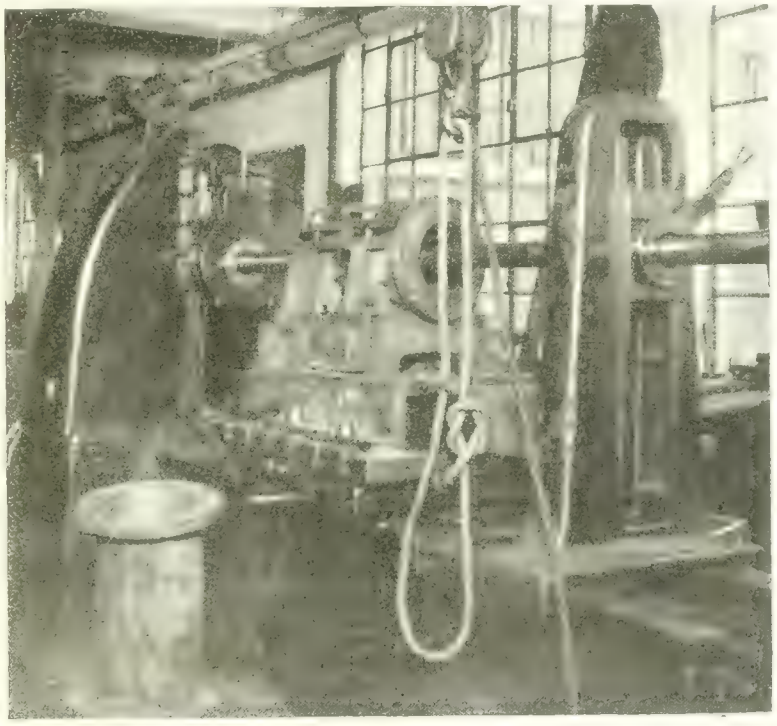
A VIEW OF EIGHT SECTIONS OF PIPE.



SECTIONAL VIEW OF ARRANGEMENT.

There is of course a certain relation between the size of hole and diameter of spindle that holds cutter holder. The smaller the diameter of spindle the shorter the radius that can be machined.

The centre of the 8 ft. radius is a bushing G that fits over a stud set in a concrete pedestal and securely held by melted sulphur. The plate H which holds bushing G has also attached to it the two arms F, which serve to move the work-holding cradle in unison with the longitudinal motion of table. The elongated slot J, in which works the shoulder stud N, serves to hold the cradle to the table, also by the aid of two bolts in back, the stud and two bolts are just loose enough to permit the cradle to slide without shaking.



GENERAL VIEW OF THE FIXTURE.

The cutter C on spindle E revolves in the same plane—the work passing it on an 8 ft. radius. The proper distance of cutter from spindle head gives a perfectly round hole—this must be found by experiment—if the cutter is not set the correct distance from head an elongated hole will be bored.

DOUBLE SPINDLE ATTACHMENT FOR LATHE

By G. BARRET

The fixture, as illustrated, was made to fit a standard lathe, and equipped to turn two drums at the same time.

These drums are used on a textile spinning frame for variation of spindle speed.

This fixture is attached to lathe in the manner shown, and is worked by the gear A (see Fig. 1), which is made to screw on to the lathe spindle. This gear meshes with pinions B and C. These pinions are keyed to shafts D, which receive their bearings in a special bracket, E (shown at Fig. 2).

These shafts are made of cast iron and the driving plate is cast solid and machined all over, then bored to suit lathe centres.

The casting F on the tail stock is made pretty heavy and bored to suit tailstock spindle; also for two steel centre holders, G and H, which are shrunk into casting after being bored.

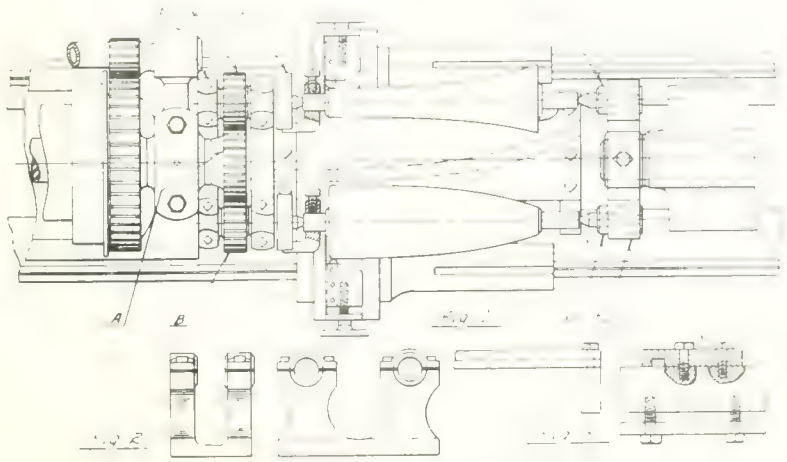
The cam plate is made to straddle the cross slide, so that the roller is free from castings while in operation. The method of fastening this plate to lathe is shown in section at Fig. 3.

The regular cross slide is removed and replaced by a special slide made to suit width of lathe and gears used for driving purposes.

As the adjustment for cuts is but small, the tool blocks are made to move by a small screw and handwheel, shown in drawing.

The front block is made high enough to allow the cutting tool to operate above centre, as the front drum is caused to revolve the reverse way by the gear and pinion, A and B.

This attachment not only produces two articles at once, but they are bound to conform one to the other.

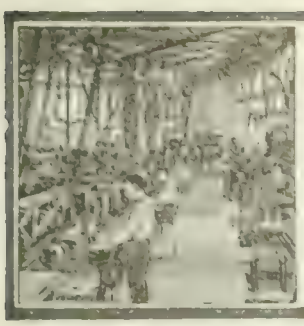


VIEW ILLUSTRATING THE IDEA

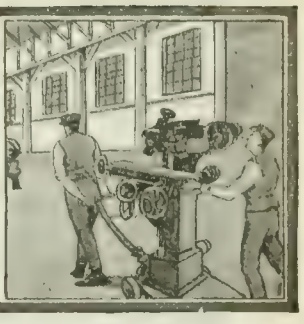
Until lately a handsaw was one thing and a circular saw was another. But now an enterprising manufacturer has brought out a portable tool in the shape of a hand circular saw with electric drive, that should make sawing wood a pleasure. A ¼ h.p. universal motor is mounted directly on the tool, which has a handle like a regular handsaw and weighs only 12 lb. Two 3-in. saws are supplied, a rip and a crosscut, an eccentric mounting allowing adjustment for depth. The base, of aluminum, is grooved to slide on a track when a guide is necessary, such a track being part of the equipment. For ripping, the gauge slides along with the work. The saw blade is well guarded, so the tool is particularly adapted to manual-training school use. It operates from any lamp socket, direct or alternating current.

It is safe to predict that destructive forest fires will soon go out of fashion as a result of the many preventive measures being taken. Quite the latest is the forest balloon service. Experiments at an army balloon school have shown that the innovation is entirely practicable, and most efficient when in the hands of trained observers who can spot a blue wisp of smoke miles away. The observer's telephone will be an essential part of the system that will spread the fire alarm through the great forests.

By hinging the ordinary carpenters' steel square, and providing a third strip, calibrated in inches and degrees, to connect the two arms, a folding square has been obtained that may be put to many uses. It may be clamped to lay off anything from a straight line to a right angle; it will divide any angle as desired, or it may even be extended, clamped and used as a yardstick. Besides making several instruments superfluous, the tool will fold into the carpenter's tool box, unlike the cumbersome rigid square.

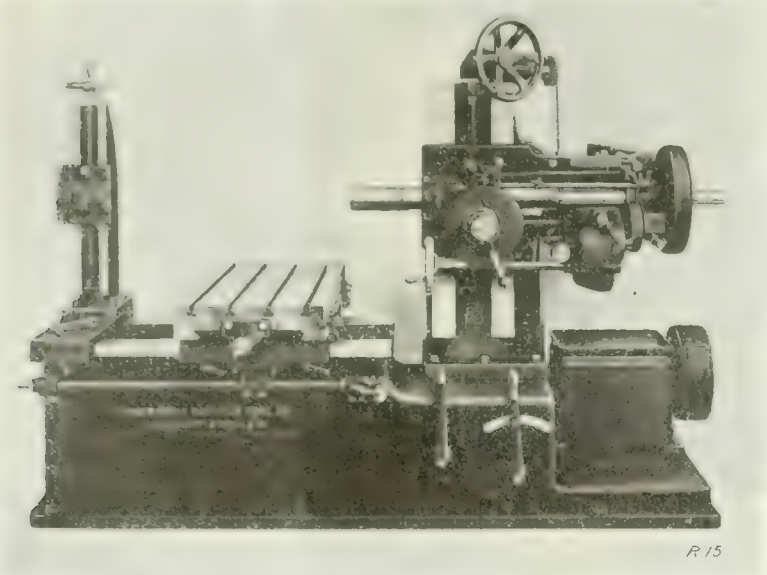


DEVELOPMENTS IN SHOP EQUIPMENT



MORRIS HORIZONTAL DRILLING AND BORING MACHINE

THE horizontal drilling and boring machine shown in the illustration has just been placed on the market by the Morris Machine and Tool Co., Cincinnati, Ohio, in answer to a demand for a machine for drilling, boring, facing and tapping operations. The bed is of one-piece box section, ribbed internally, and runs down to the floor. The column is also a box section and is bolted to the base. The bed moves on ways arranged with taper gibs, adjustable for wear, and is counterbalanced, the handwheel at the top of the column serving to raise or lower the head. A steel scale graduated in sixteenths of an inch is set into the column, and this in connection with the micrometer column on the head elevating screw enables readings in thousandths to be obtained for the full travel of the head.



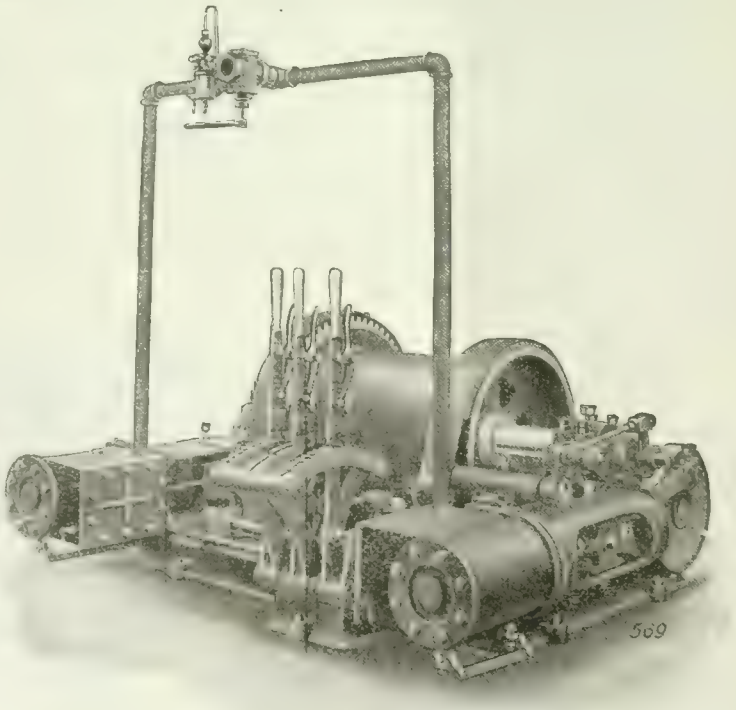
GENERAL VIEW OF THE MACHINE.

The spindle is of forged high-carbon steel ground to size, the thrust being carried on ball bearings. The sleeve is graduated and provided with a direct-reading depth gauge. The spindle drive gears are helical, this construction giving smoothness of action and the elimination of chatter. The back gears are of 3½ per cent. nickel steel, heat-treated and hardened, and are fully enclosed and mounted as a unit on the back of the head. The speed box is mounted on the bed with the gears fully enclosed and running in light grease. Six speeds are provided, controlled by two vertical levers on the front of the bed below the column. The lever at the left controls the double friction clutch and pulley shaft, and the other lever the three sliding gears. The feed box is also a unit mounted on the head, the gears being enclosed and running in oil. Six speeds are provided that can be automatically tripped at any depth within the traverse of the spindle.

The bearings throughout are of bronze arranged with oil chambers, the oil being drawn into the bearings by felt wipers. The machine shown is for belt drive, but motor drive can be furnished if desired. In this case a three-to-one variable-speed motor is connected to the lower shaft by one pair of gears or a constant-speed motor used in connection with the speed box.

A NEW LINE OF MEDIUM AND SMALL STEAM HOISTS

REALIZING the demand for medium and small-sized high grade hoists for mining and industrial purposes, the Canadian Ingersoll-Rand Co., Ltd., has placed on the market a line of such hoisting engines, embodying many new features of design which will commend themselves to those who are familiar with the usual construction of machines of this class. These improvements have been adopted as a result of their long experience in the manufacture of mining

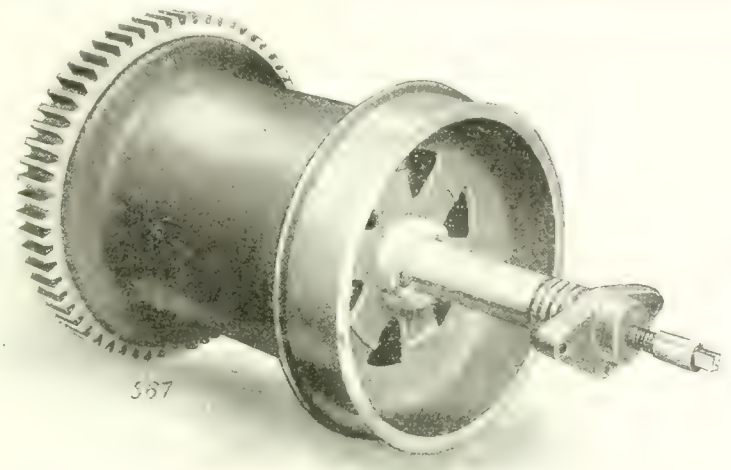


GENERAL VIEW OF 7 x 10 INCH. SIZE NEW "CIRCO" STEAM HOIST.

machinery and contact with users in all parts of the Dominion.

During the war this firm, which was one of the largest producers of shells and shell machine equipment in Canada, also built several hundred ship winches for the United States Emergency Fleet Corporation, the Federal Construction Co., the Foundation Co., etc. In starting to manufacture this new line of hoists they decided to design jigs and fixtures, and produce the engines in quantities, on the interchangeable part system which had proved indispensable in the rapid production of ship winches, and which has been one of the most important factors in the development of the modern automobile and machine tool industries.

While the company is ready at all times to make these hoists in larger sizes on special order, they are at present concentrating on the production of five sizes, ranging from 6x8 to 10x12 inches, with lifting capacities which are conservatively rated at from 4,000 to 10,000 pounds.



DRUM, DRUMSHAFT AND FRICTION OPERATING DEVICE OF NEW "CIRCO" STEAM HOIST

Some of the interesting points in the construction of the new Circo hoists are as follows:

The cylinders are cast separately from the side frames and are interchangeable, thus permitting one spare cylinder to be used on either the right or left hand side of the hoist, and doing away with the scrapping of the side frame of the hoist should one of the cylinders become accidentally damaged in some way.

The exhaust may be connected to either the top or bottom of the valve chest when the hoist is operated on steam as may be most convenient, the opening not in use being plugged. In case it should be desirable to operate the hoist by compressed air for any reason, this extra opening will be found valuable as it will enable the air to exhaust more freely than is possible with the old style valve chest. The cylinders are bolted to the side frames by strong turned studs and faced nuts, and the walls are amply heavy to permit operation at maximum pressure after reboring.

The interchangability of the cylinders is typical of the construction of the entire machine, every part being made to close limits, of the best materials and thoroughly inspected throughout the various steps of manufacture. As the hoists are so easily dismantled they should prove of special value in the case of isolated mines where the machinery has to be transported long distances by horses or mules.

The valves are of the plain slide type and are provided with an adjusting device which automatically compensates for wear without changing the original alignment of the valve rods. The valve rods are guided by carefully fitted babbitted cast iron guides attached to the side frames.

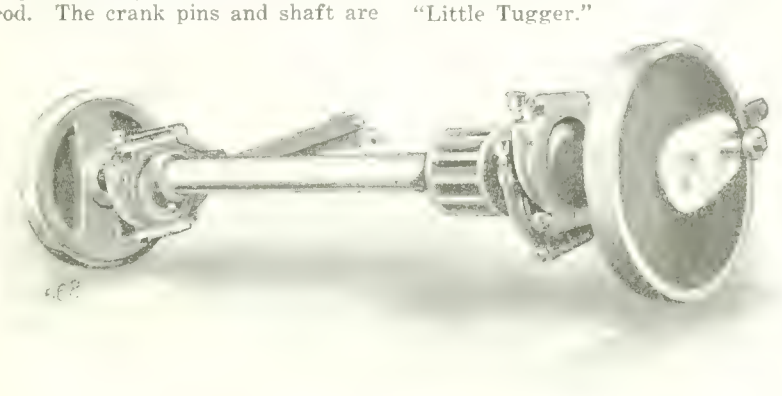
Locomotive type eccentrics are used, which are characterized by deep, flat rods bolted to the straps by turned bolts in holes which are reamed after the valves have been set, preserving the accuracy of the original setting. The eccentric straps are provided with large bearing surfaces and are adjustable for wear.

Connecting rods are of steel of the solid end type, having bronze boxes in both the crank and cross head ends, provided with wedges and screws for taking up wear. The screws are made adjustable in opposite directions, so as to insure approximately the same length in each rod. The crank pins and shaft are made of the best grade of open hearth hammered steel fitted to the cranks (which are of the counterbalanced disc type and finished all over) by hydraulic pressure. To insure accuracy the discs are turned and the crankpin holes bored after the disc has been pressed on the shaft.

The drum shaft bearings are bolted to the side frames instead of being cast integral as has been the usual practice for many years. A high grade of babbitt is used in these bearings and they are adjustable for wear. The drum is made of close-grained cast iron, turned, bored, and tested for a good running fit on the drum shaft. The bearings being bolted to the side frames ensures accurate alignment of the shafts and easy running gears. A heavy brake ring is cast on one end of the drum, and on the other a friction of the heavy V type which has proved its efficiency for this class of service. The brakes are so proportioned as to have a holding capacity considerably in excess of the maximum lifting capacity of the hoist, which is of value in case of emergencies, or should the hoist be overloaded. The drum driving gear and the pinions are made from semi-steel, a material which has been found well adapted for this purpose. The pinion is keyed to the crank shaft so as to permit its ready removal when necessary.

When reversing engines are ordered the hoists are fitted with a Stephenson type reverse gear, operated by a hand lever with quadrant and locking latch, which for ease in operation, is placed with the clutch and brake levers in a stand near one of the cylinders, thus grouping all of the control levers near the throttle, and within convenient reach of the operator.

This firm also builds two styles of hoist of smaller capacity than their new Circo hoists, which are known as the "Special" and the "Little Tugger" types. The former is of the diagonal reciprocating type, with trunk pistons, and the latter of the square piston or Dake type, both of which may be adapted to operate on either compressed air or steam. Being of rugged construction and requiring no special foundation they are readily moved from place to place, and have a wide range of usefulness where the requirements are within range of their capacity, which is 1,400 pounds in the "Special," and 1,000 pounds in the "Little Tugger."



CRANKS, CRANKSHAFT, ECCENTRICS AND PINION OF NEW "CIRCO" STEAM HOISTS.

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A Dangerous Thing To Do

MAKERS of boots and shoes are seeing to it that advance notices are being well circulated to the effect that prices of boots and shoes are going to "increase enormously."

The same is said of clothing. It is not at all necessary to stop at these two lines, but they are taken because reference to them has been made very recently in all sections of the press.

Just how long the public temper will stand for this sort of business is problematical. It is a safe guess, however, that every price boost has its effect on the public mind. How long can this sort of business continue without the strain becoming greater than the temper to stand it?

Manufacturers of all sorts, no matter if they are turning out the finished product, or semi-finished, or raw material, know as well as any other class of people that labor troubles are greater now than they have ever been. They know, unless they are too blind to admit it, that the failure of a strike to win does not mean that labor unrest has been cured. It means that it has been aggravated, and unless conditions change it will break out anew.

Ask many of the men who are strikers, or who have been, what is their complaint. Make allowance for the agitators and all the rest of that ilk, but see to it that you listen seriously and honestly to the man who would much rather work than strike.

What is his complaint?

Simply this: His expenses are increasing to such an extent that his wages cannot keep up. He is going behind. He has not the power to force all those with whom he does business to see that his dollar buys more than 52 cents' worth. All he can do is reach out and try and increase his earning power.

If boots and shoes "increase enormously," and if clothing is "much higher" the wages of men who have to buy these things will either have to "increase enormously" or go "much higher."

Now this is a very real and a very dangerous situation. Right now, when this whole continent needs production, needs a co-operative feeling between shop and office, needs fewer strikes and fewer lockouts—right now, we claim, it is nothing short of crime to upset and disturb the public mind with notices of further increases in the prices of those things that people must buy if they are going to live decently.

The man who will bluntly stand, in the face of all the labor unrest, and tell that his company's profits were 70 per cent., and that the business was not run for the glory of God, but for the shareholders, is lacking in his sense of appreciation of what citizenship really means.

The men who, as individuals or corporations, are responsible for sending out intimations of large increases in the necessities of life, are likewise barren of any indication that they realize the seriousness of their movement.

If men are going to continue to make the grabbing off of dollars the greatest job in the world, then we are going to have a tremendous heap of trouble, and it is very doubtful if it will be possible to shove in the peg at the stopping point we may think desirable.

To those in authority to-day, both in Canada and United States, we would say: "Gentleman, do not wait until the crowds parade the streets with bricks, or until they start to shoot; don't imagine these things are impossible. They are not. They are dangerously probable."

The man who is seeking, even after what we have passed through, to mulct the public, and to make it harder for men to live decently, is a menace to the peace of the country. The jail is the only place for him, and the sooner he is securely locked there the sooner can we go ahead and attend to our right and legitimate business.

Tinkerin' John

HE was just a sort of a handy man as he canted around the shop, and everything got done the same with a kind of a skip and a hop. He did odd jobs and just filled in whenever a chap was off, with the gout or rheumatiz or such, or nursin' a graveyard cough.

But they'd never give him a steady job, this tinkerin' chap named John, for fear that somethin' he turn or do would have a chance to be wrong. So he puttered around at this and that, and he worked from bell to bell, but Tinkerin' John could never do a particular job real well.

Oh, Ive seen a heap of tinkerin' Johns; you meet them East and West, and they couldn't, to save their bloomin' hides, name the job they could do the best.

They can tinker at this and tinker at that, and they're handy to have around, and they always stay on the ladder quite near where it hits the ground. And when there's a chance to go higher a bit, where pay is both thick and long, they never turn to give a chance to this here tinkerin' John.

Oh, I've seen a heap of tinkerin' Johns; you meet them up brown, and do it better than any chap what's campin' in the town. It's great to see the hand of skill linked up with a mind that's keen; that can take any job that comes along, the fat as well as the lean—and can do the thing bang up each time with never a flaw to spoil—it's chaps like them that help to bring real honor to honest toil.

But tinkerin' John, he's always here, just fiddlin' his years away; a sort of a handy chap to have and never one hard to pay.

There's a bit of a sermon here for you—don't dodge nor pass it along—if you want to get to the top of the heap don't be just a tinkerin' John.—ARK.

The Case from the Draftsman's Point of View

By One of Them

IT is quite refreshing in these modern days of camouflage to read an article such as written by one who signs himself "Engineer," on page 79 of your July 24th issue of CANADIAN MACHINERY.

Evidently this engineer is also a draughtsman, otherwise he could not discuss so freely and intelligently the ins and outs of the situation. There is a saying that, United we stand, divided we fall; so if I may be allowed a short space I will try to confirm and establish some of the points brought out by the original article, at the same time slipping in a few ideas of my own.

First and foremost, the writer remarks, "Yea, verily," to the suggestion of making a dividing line when speaking of draughtsmen, designers, detailers, and tracers. Why should the chap who has industriously stuck to his guns, studied evenings at home, or at school, and read up up-to-date technical literature, get a paltry two to five dollars more a week than the other fellow, who merely puts in his seven or eight hours a day, as the case may be? Do you blame the chap who has the ambition and initiative grouching at the unfair value placed on his ability?

Such a condition will remain in vogue just so long as employers continue to view their drafting staff as an organization, which, unfortunately, has to be put up with.

Some readers might not be inclined to agree with this remark, so, in order to prove at least one case in point, the following tale is told.

In a certain munition plant (never mind the name or locality), machinists were making on an average of 70c to 80c an hour; toolmakers were drawing as high as $1.00 to $1.25 an hour; hunkies, or to be more kind, general handy men, who had learned one particular operation on shell work, were drawing as high as $100.00 for the week's work of 10 hours in the day. Draughtsmen, all kinds, designers, detailers, etc., etc., were drawing from $90 to $125 per month, not per week. Why?

To heap coals of fire on their humble heads, as it were, this firm paid bonuses to all help mentioned, with the exception of the drafting staff. This, naturally, peeved the pencil pushers, who timidly requested enlightenment as to why such a state of affairs existed. "You fellows are 'non-productive'," was the laconic answer.

Do you blame the average draughtsman for- having very thin hair on top and none in front if he must listen to such a tale. No wonder he pulls his hair out. Who designed the tools for this plant spoken of (?) Could the toolmakers, all respect given them, have designed, as well as assembled the dies, etc., required? Without the dies and tools could the handymen have turned out the shells? Yet the poor draughtsman was non-productive.

And now we will talk of the average apprentice, who is on his last stage of apprenticeship and about to become a full-fledged designer (?) all in his four years' experience.

Personally, when the writer had completed his four years he was only beginning to sit up and take notice, yet he had never slouched on the job, but tried to stick to his guns, studied evenings, read all possible literature, especially on tool and jig design, which was the particular field he was interested in. This brings us up to the point where we ask the question: "Is four years sufficient to make a draughtsman?" The writer's answer would be: "In four years you can make a draughtsman, but not a first-class designer, especially with the average system now in vogue."

The writer agrees strongly with "Engineer" that actual shop experience is absolutely essential to an apprentice if he desires to become an intelligent designer. The machine shop, tool room, patttern shop, and foundry, should all form a part of his training. He should now, at least, be a real designer if he has paid attention to all these branches. Of course, the old point crops up once more, that after he has mastered all these little trifles (?) he receives the usual average salary meted out to the slaves of the drawing board.

Readers might well say, "Why should an apprentice require such wide training?" To answer such a supposed question let us first suppose we are in the machine shop watching a planer hand at work on a large bed of a machine, one surface of which is being planed, not all the way through, but which must be stopped at a certain point. To those acquainted with the machine-tool trade it is not necessary to state that certain allowances must be made for tool clearance purposes, where the stroke of planer trips and reverses the direction of the table.

We, in imagination, see this planer hand stop his machine to chip out a clearance space for his tool, at the same time cussing draughtsmen in general for their lack of brains.

We now, still in imagination, go to the drafting room, where the chief has heard of the trouble spoken of. "Say, why didn't you leave clearance for the tool on piece so-and-so?" he asks the draughtsman responsible for the blunder. "I did," comes back the answer, "I allowed over ½ in. long and 1-16 in. deep. Wasn't it enough?"

If this chap, who we have been imagining about, had spent even one day on a planer, he would not have made such an apparent blunder. Of course, all are not like this, but the extreme example is mentioned to bring out the point that actual working conditions must be known before a designer can design to the highest point of efficiency.

Then again, by a good understanding of pattern making many a dollar can be saved in the drafting room. The same holds good for the foundry in regards to castings, which, I believe, will convince the doubtful reader, if any, that shop experience is essential in the making of a real honest-to-goodness machine-tool designer.

All these knocks and grumblings may sound as if the writer has a personal grouch at the business. To those who have read this far let it be said that the writer wishes he could work up a real sized grouch at the trade, sufficient to disgust him enough to leave it, but no—the fascination of the game is too much for him in spite of its disadvantages. Sometimes it seems as if the employers have secretly found this weakness out in the average designer, and play on it for all it is worth.

There is many a designer to-day who realizes only too well he is underpaid, and yet loves his job of creating things in general too well to leave it for something more lucrative.

Is there any remedy for this situation, or is it something which simply must exist?

To the writer's opinion there is a remedy, but one not likely to occur. The remedy that has been employed with so much success by the branches of the engineering trades outside of the drawing office, can be applied to those in it. That is, if they can get together and compose their own differences and adopt a real standard of efficiency with a minimum reward.

— —

Coal for Bridgeburg.—Bridgeburg received its first coal for the season this week. Consumers are now being supplied, but coincident with this comes a warning from D. A. Coates, of the Provincial Natural Gas Co., that gas will be increased forty to fifty cents per thousand in September next. He also warns consumers to use gas for cooking and water heating only, as if they use it for house heating there will be a gas famine.

Worth-While Information From Many Points

In Chicago there is a bureau devoted to finding employment for men 45 years and over. It is estimated that over 20,000 men have thus found employment. In practically every case the concerns who hired the men came back for more, which proves you are not by any means a dead one at 45 and over.

* * *

Mixing dry colors in ready mixed paint with the ordinary paddle to get the desired shade is a decidedly tedious job and unless thoroughly mixed will be streaked and spotted when applied with a brush. A much quicker method of accomplishing the mixing is to use an egg beater, which also eliminates the skin and other foreign matter from the liquid.

* * *

The British Government has decided to offer a prize of $10,000 for a process of making a mixture of dehydrated coal tar with mineral petroleum oils suitable for Admiralty use as fuel oil. This will be awarded to the first competitor submitting a successful process which must be capable of ready and economical application without undue absorption of material and labor.

* * *

If two parts of copper and one of tin are mixed, it makes a white alloy which has a brilliant lustre, and will take a high polish. This alloy is known as speculum metal, the technical name for telescope mirrors or reflectors. The addition of 1 or 2 per cent. metallic arsenic makes the metal more compact and gives it a greater lustre and hardness, but renders it liable to be tarnished. It is nearly as hard as steel and as brittle as sealing wax.

* * *

Tracings may be very readily cleaned and pencil marks removed by the use of benzine, applied with a cotton swab. It may be rubbed freely over the surface without fear of injury to the lines drawn in ink, or even water colors, but pencil marks and dirt will quickly disappear. The benzine evaporates almost immediately, leaving the tracing unharmed. The surface, however, will be somewhat softened, and should be rubbed down with a little powdered talc or chalk before drawing more ink lines.

* * *

The metal layers of an engine that come in contact with one another rub off small articles of matter that combine with the lubricant used and form a dirty and sticky mess. The olein contained in the lubricant will in course of time form an acid, known as oleic acid, which has a deleterious effect on the metal parts that it touches, causing progressive corrosion. But luckily, it is only when its oleic-acid content exceeds one-quarter of one per cent. that an oil becomes unfit for lubricating purposes.

Celluloid articles can rarely be restored to their original whiteness if they have been thoroughly discolored throughout, but if merely superficially discolored, wipe them with a woollen rag wet with absolute alcohol and ether mixed in equal proportions. This dissolves and removes a minute layer of the surface being cleansed and lays bare a new surface. To restore the polish rub briskly with a woollen cloth and finish with silk or chamois. A bit of jeweler's rouge will greatly facilitate matters.

* * *

Electric current is available to most people, but it is not always apparent whether it is direct or alternating, 110 or 220 volts. A new pocket instrument, 4 inches long, 2 inches high, and 1½ inches wide, has a dial at each end in which the letters "A. C." or "D. C." appear, as the case may be, when the flexible cords are connected to the circuit. The voltage is indicated in the same manner. Provision is made for connecting to any kind of terminal, a plug being provided into which the posts on the wire-ends fit, for lamp-socket testing.

* * *

Lead poisoning is being investigated these days, because of its widespread existence in various industries. The Working Conditions Service, Department of Labor, has prepared, as a guide to industrial physicians, a schedule for the physical examination of lead workers, in which provision has been made for covering not only the typical manifestations of lead poisoning but also for bringing out the previous history of the worker, to determine whether hazards in other industries may have had an adverse effect upon the health. This schedule has been forwarded to districts in which lead poisoning in the pottery industry has appeared.

* * *

Regulations have now been laid before the British Columbia Legislature in which there is to be the provision that every winding rope shall be given a bath in hot oil before being installed; that every winding rope shall be recapped at intervals of not more than six months; and that no winding rope which has been in use for more than two years, or which has been spliced, shall be used for raising or lowering persons. No cable is to be used for more than two years for raising or lowering persons. In this country the Royal Commission on Mines in 1909 recommended that winding ropes should be allowed to be used for three years and six months. To prevent crystallization of chains it will be provided in the new B. C. regulations that all cage chains in general use shall be annealed once at least in every six months, and detaching hooks shall be cleansed and refitted once in every three months.

* * *

Word comes from the north-east coast of England of a vessel that has been designed to meet the need of an unsinkable ship. To accomplish this end the bridge of the ship is made watertight, and is made large enough to accommodate all the people and valuables on board. It is not made integral with the ship, but is attached thereto with easily-detached fastenings, and in the event of the hull being mined or torpedoed, the bridge will have enough buoyancy to float and sustain the weight of the immersed hull. The crew and passengers can remain in the bridge until taken off or towed into safety. If the hull through very bad weather becomes a danger to the bridge it can be released and allowed to sink, leaving the bridge afloat.

* * *

Stamping, drawing, and general press work on cupro-nickel can be accomplished as easily as with brass, according to the "Metal Industry." The metal can be more drastically treated, and stands greater reduction than brass, although more power is required than for working most alloys. Annealing cupro-nickel articles between operations is not advisable, chiefly on account of the great tendency toward fire-cracking and the production of excessive scale, which is very difficult to remove, and which, unless entirely eliminated, will ruin punches and dies.

* * *

Zinc water pipes which come in contact with mortar containing gypsum become in a relatively short time corroded and eaten through. Where the surface is wetted and quickly dried a protective coating of zinc oxide is formed, but where the contact with running rainwater is prolonged, such as in the case of roofing plates and gutters, energetic action must be reckoned with. According to "Building News," the most active agent of destruction is sulphate of lime. Zinc is energetically attacked by mortar containing gypsum sand, but only feebly by mortar containing limestone sand alone, or with an addition of gypsum. Lead, on the other hand, is energetically attacked by limestone alone and with an addition of gypsum, but only feebly by gypsum sand mortar. Both metals are strongly attacked by pure cement, but the destructive action is lessened by the addition of sand. Hence zinc should be put in contact only with limestone—carbonate—mortar, and lead only with gypsum—sulphate.

The Oil Works of Canada, Limited, have opened an office and factory at 29 Prince Street, Montreal, to manufacture the Hvid type of oil engine. M. L. G. Vincent is the managing director.

MARKET DEVELOPMENTS

Buying is on a More Generous Basis Now

Many Lines Represented in Inquiries and Business Now Being Booked—Prices Show a Decided Tendency Toward Higher Levels

THERE is a steady improvement in machine tools and supplies, and there is more general buying of steel and kindred lines. All through the summer season business has been showing a betterment, and there are indications that it is going to continue.

One thing seems to be quite certain, and that is that the lines represented that are buying now are well distributed, indicating a much more general activity than has been noted for some time. Several very good inquiries are in from the mines this week, while the railroads, automobile and agricultural industries are also buying.

Price lists for the most part remain the same. There can be no dodging the fact that the tendency is upward, and that a new list for certain kinds of steel products will likely be out before long. Warehouse interests in several instances have been advised to protect themselves against any outstanding quotations they have on present figures, and to close the business or cancel, as new lists are on the way.

It is become more evident daily that those who have stayed out of the market, hoping for better prices on machinery, or on raw material if such material came from the steel market—are in for a disappointment. The lower price has not arrived, nor is there any indication that it can for a long time to come. The fact that prices are stronger and likely to increase is a sign in itself that buying will be brisk for some time to come, fearing that further advances may be coming.

The scrap market shows even greater strength than it did a week ago. The scarcity of heavy melting is becoming more marked, and it may be that better prices will have to be offered to bring out any of this material. This same condition is developing to a marked degree in United States, where it is recorded that heavy melting is selling for more than pig iron, certainly an unusual situation, due, no doubt, to local conditions.

SELLING BECOMES MORE GENERAL IN MONTREAL MARKET LATELY

Special to CANADIAN MACHINERY.

MONTREAL, Aug 7.—While the outward signs of business do not appear to show any marked degree of activity, the reports that can be gathered from different sources would indicate that industrial life is gradually assuming a more staple character. A feeling of confidence seems to be taking hold more rapidly, but there is still much room for improvement. However, it cannot be expected that sudden developments should take place and while business is gradually increasing there are many who claim that existing circumstances prevent the carrying out of enterprises that would be possible if industrial conditions were more favorable. The steel trade here continues steady, but does not show the increase that has taken place in other directions. Machine-tool dealers are reporting comparatively good sales, and it is interesting to note the gradual increase in the enquiry for new equipment. Many users of machine tools have been waiting for an easier market, but are beginning to realize that there is a probability that quotations will go above the advances that have been made recently. Metals are still moving freely, and the situation in this respect would indicate that further activity might develop. Old material dealers that have been laying in stocks may reap the result of their foresight in the coming weeks, as the continued strength and good demand has stimulated buying to some extent.

Steady Growth in Metals

"The better demand that has developed for all metals during the past few weeks would seem to prove that business, generally, is returning to a more normal condition. Consumers that have apparently been waiting an easier market in which to purchase metal have been disappointed, and are now realizing that a marked decline in prices is very unlikely. In fact, our impression is that the present is a good time to buy, and many consumers are seeing the advisability of covering their requirements, not only for the present, but future buying is in larger volume. The present market is quite strong. We are not making advances this week on anything but tin; this market has become stronger and we are asking 59 cents per lb. Copper is going better, and also spelter. Brass mills are taking considerable metal." This statement by a dealer here, reflects the better tone of the market and the steady character of the business now being done. The dealer remarked that the German interests have not yet traded heavily in American copper, but believed that feelers were now out for considerable tonnage.

Better Machine-Tool Demand

That general business conditions are nearing a more progressive stage is shown by the optimistic reports of machine-tool dealers. The enquiries that are coming in are not for large single orders, but the sales are more numerous, due to the fact that a greater number of buyers are coming into the market. In the larger number of cases the purchasers are for one or two machines, but it is in the quantity of such orders that gives to the market the feeling of better times. As one dealer remarked: "We are looking forward to a good fall in respect to the sale of machine-tools. The fact that we are now selling more new tools would indicate that many are giving up the idea that prices on tools will come down. Second-hand equipment is still going good, but the sale of new machines is steadily growing. Grinding machines and millers are the best sellers." There is no doubt that many industrial strikes have affected the activity in machine-tools, but with settle-

ments being made or adjusted, the probability is that an increased demand for tools will follow.

Scrap Sales Still Good

Scrap sales for the week have been on a par with that of the previous week, but the inquiry is good and the consumers are buying freely, but sales for future needs are seldom made. The better business at present is being done in the non ferrous scraps, steel purchases being on a comparatively "hand to mouth" basis. "Our sales for the week have been good," said one dealer, "and the outlook appears satisfactory, but many consumers hold up their hands when future buying is suggested. We have had a few fluctuations in prices during the week, but those listed are nominally correct."

BUYING BECOMES MORE GENERAL NOW

TORONTO.—A large number of industries are represented in the purchases that are being made this week. There has been a gradual improvement in this respect, and each week sees lines coming into the buying list that have been absent for some time. This may be due to business that is pressing, or to the fact that the market all around for machinery, supplies, or steel is stronger, and increases are being made.

The scrap metal market continues strong, and is still marked by a real and acute scarcity in some lines, particularly heavy melting steel. There does not seem to be much of this material to dispose of, and there is also a scarcity of machinery scrap, the demand for this latter being brisk, with the offerings correspondingly poor. There is some speculation as to whether much of these "wanted" metals are being held back for still greater increases. It would appear that there should be more of this material in the country. It may be that labor is not available to bring it out, or that the price is not tempting enough, but the fact is that it is not making its appearance.

The Steel Market

Seamless steel tubes are about due for an increase, although the new prices were not announced yet, but the warehouses are calling in quotations that were made some days ago, and which have not been closed with. The increase will probably be about 2½ per cent., and the only good reason that CANADIAN MACHINERY can find for it is that there is a great demand for tubes just at this time, and many of the mills are booked well into the future.

Sheets have gone up at the mills in some places, although there has been no increase at the warehouses. Advice received by CANADIAN MACHINERY on the sheet situation this week states: "We believe that all of the mills are entirely sold up for third quarter delivery, and we know of no manufacturer as yet quoting jobbers for shipment throughout the fourth quarter." The same advice goes on to state that "Further advances in prices both upon sheets and tin plates may be expected within the next few days."

There seems to be a difference of opinion in the market regarding the plate situation. Advices from very reliable sources continue to refer to plate as the weak spot in the steel situation, while others point to the fact that operations are gradually approaching some 70 per cent. capacity at many of the mills. There was one order for some three hundred tons that went to a Cleveland mill a few weeks ago, and the impression seemed to be abroad then that the selling agency in this country had broken the 3.65 price. However, it turns out now that such was not the case, and the business was secured because the mill in question had a more advantageous lake and rail rate than the Pittsburgh mills. The price was 2.65 f.o.b. mill. One dealer this morning was willing to stake his reputation on the fact that a higher schedule for plate would be announced inside of a month. This hardly seems likely, as there is a very large plate capacity in the steel centres now, and it can take on a lot more business before coming to the point where capacity will be in sight.

Drills Are Cheaper

A ten per cent. reduction was announced in Canadian drills this week, high speed and carbon. Buying of supplies is improving. Dealers in this district are already beginning to get some of the daily breakage in the way of business, and this has been entirely absent for several months in most shops, as there has been little work.

POINTS IN WEEK'S MARKETING NOTES

Instead of dropping off, as is usual in the hot weather, buying at the steel mills is actually showing an increase.

A ten per cent. reduction is announced by makers of Canadian drills.

Steel tubes, seamless, advance slightly, about 2½ per cent.

Machine shop supply trade is improving as more shops are coming into active operation following settlement of the strike.

The Steel Corporation is not favorable to price advances this year, although the steel market all through is much stronger.

Several independent mills have advanced prices $2 a ton on black sheets and $4 a ton on galvanized.

Dealers who bought shell steel scrap some weeks ago above the market figures at that time can now turn around and sell at a profit. Most of them are "sitting tight" and little heavy melting is coming into the market.

SCRAP BROUGHT MORE THAN PIG

THE scrap market shows great activity, with higher prices all round. No. 1 cast scrap has sold higher than pig iron in one district. Following are reports from U. S. points:

PHILADELPHIA.—Steel scrap has been quiet in the domestic market, but a very large sale of heavy melting steel for export has been made. 2,000 tons stove plate was sold to a New Jersey interest at $21, delivered.

BOSTON.—Dealers are buying any lots that come on the market, and prices are high. The slight falling off in buying by consumers had no effect in lowering prices. Machine shop turnings have brought $10.50 delivered, and $21 has been offered for malleable scrap.

NEW YORK.—Fairly good demand in all grades, with prices steady and tending upwards, is the market condition here. $21 delivered has been reported for heavy melting steel for Pittsburgh, but the local price is around $15.50 to $16 f.o.b. New York.

PITTSBURGH.—Dealers are holding stocks for higher prices, it is pretty well believed, and heavy melting steel may see $25 before long. Some small orders have been closed at $22 for this grade. Machine shop turnings are quoted at $14.50 to $15.

BUFFALO.—Heavy melting steel is in active demand, and dealers are holding their stocks. Outside districts are offering higher prices than local consumers will meet. $22.50 delivered has been offered for heavy melting by valley mills.

CLEVELAND:—Trading is better, and both scrap iron and steel are showing strength. Heavy melting steel has advanced $1, and is quoted at $21 to $22. Demand for all grades of scrap is strong, steel rails and car wheels going up about 50 cents.

CHICAGO.—No. 1 cast scrap has sold here at higher prices than pig. $28 per ton has been secured for this grade for fair sized quantities. Re-rolling rails and stove plate are almost unobtainable. Railroad offerings are light.

CINCINNATI.—Most grades are firm, greater activity having been noticed in the cast iron and steel scrap market lately. There is some talk of a scarcity of scrap should the melt increase. The ordnance department is expected to offer some scrap shortly.

ST. LOUIS.—Dealers are piling up material in their yards, and are not keen about selling at present prices. Re-rolling rails have gone to $28.50 and $29 per ton. Stove manufacturers are operating at a good capacity, and prospects for fall and winter are good.

USED TOOLS WERE NOT MUCH BELOW PRICES THAT WOULD SECURE NEW ONES

Special to CANADIAN MACHINERY.

NEW YORK, August 7.—For the first time since the financial position of the railroads became so critical, one of the roads, the Cumberland Valley, a subsidiary of the Pennsylvania, has come into the market with an expenditure of about $100,000. Orders were placed with the Philadelphia dealers for about 25 tools. The list was issued several months ago, and the trade has begun to think, that, like many other recent railroad inquiries it would come to naught. The purchase is encouraging in that it shows the need of the railroads for new and modern equipment, and further shows that funds are forthcoming when the Railroad Administration is definitely persuaded that the need is an urgent one.

In the absence of large lists in the East, business in machine tools during the past month has been confined largely to small lots, but it appears from the reports of some sellers as to July business that the aggregate of these is better than has been supposed. In fact quite a fair proportion of machine-tool buidlders are now in a fairly comfortable position as to orders, while a few are downright busy. Compared with pre-war records a very satisfactory machine-tool business is being done; the fact is, however, that many machine-tool plants so greatly increased their capacity during the war that they are figuring on total capacity rather than on the business they did prior to war times.

Auto Business Buying

Some of the largest orders continue to come from the automobile industry, as, for example, a $500,000 contract for automatic machines received by a New England builder from a Detroit automobile company, but thereis an increasing amount of business from other industries. A Chelsea, Mass., shipyard has bought a list of plate-working machines; a New York concern has expended $50,000 or more for plate-working machines and tools for a ship repair plant, and new equipment has also been purchased by the Bethlehem Shipbuilding Corporation for its Sparrows Point, Md., yard. The Bethlehem Steel Co. has been an active purchaser of various kinds of equipment for its steel plants. Sentiment in the steel trade clearly indicates that, barring labor troubles, this fall and winter will be unusually active.

The Export Business

Export business is in fair volume. Chinese and Japanese inquiries have appeared in the market, chiefly for large tools for railroad and shipyard work. The Standard Oil Co., of New Jersey, had revived an old inquiry for about 75 tools for Rumania. The list was issued months ago, but no action has been taken. It is expected, however, that purchases will now be made very shortly.

August starts out under good auspices. The trade has just had a good month, and if customs of former year prevail there should be increasing activity as the autumn months approach. Certainly sellers are on a firmer foundation for there appears to be no prospects of further weakening of prices, but on the contrary the indications point the other way. Some prices have been advanced and others are likely to follow. Lathe manufacturers have advanced prices from 10 to 15 per cent.; a manufacturer of plate-working machines has advanced about 20 per cent. and a turret lathe maker has put an increase of about 17 per cent. into immediate effect. Some of the prices paid for used tools at an auction sale held recently at the plant of the Standard Aircraft Corporation, Elizabeth, N.J., pointed to a strong condition in the market as they were within close range of the prices now quoted on new tools of the same types.

Some of the second-hand machinery dealers who attended the sale were quite content to look on as the prices being bid by manufacturers who wanted the tools for their own use were above what any dealer could pay and resell at a profit.

BIG PRODUCERS ARE OPPOSED TO HIGHER STEEL PRICES FOR THIS YEAR

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., August 7.—Despite the fact that now is the middle of the midsummer period, almost invariably a very dull one in the steel market, trade conditions are visibly improving. The volume of buying keeps up, if indeed it does not increase, and prices show a stiffening tendency. In this they reflect the heavy bookings all the mills have done. Shipping orders in July, including new orders and specifications against contracts, made a total tonnage fully double the shipments in the month. The only undesirable feature of the market situation is that the buying is poorly distributed among the products. There is too much buying of some products, more than the mills can take are of, and too little in others. Thus the lap weld departments of the pipe mills are sold up to the end of the year and are making five-month delivery promises, while the plate mills are operating at less than half capacity and the rail mills are doing practically nothing except by way of producing rails for export.

Steel mill operations are now estimated at fully 75 per cent. of capacity, based on ingots produced, or perhaps a trifle more. The output for July as a whole will probably show somewhat over 70 per cent., against 67 per cent. in June, and 54 per cent. in May, the month of lowest production.

Steel Price Advances

While members of the steel trade do not disagree with each other as radically, and certainly not as vociferously, as members of the United States Senate, there are very marked divergencies of opinion as to price policies. Some producers are committed to making every price advance that seems feasible, in other words, doing everything "they can get away with," while others regard it as much wiser, and likely to prove much more advantageous in the long run, to hold prices precisely where they are. More than a month ago the United States Steel Corporation, without making any formal or official statement, allowed it to become distinctly known that it was opposed to any steel price advances, this year at least, and that is still very positively the Steel Corporation attitude. It is not alone in this position, there being at least one or two large independent producers that share the view. Just why some independents are so anxious to advance prices is not made altogether clear. They can hardly believe that the steel market is capable of advancing indefinitely from the present level, and present prices are certainly highly profitable to any mill that has full operation. Prices cannot be advanced in any line where there is not full operation. Those who believe in holding to present prices contend that the period of market activity will be prolonged thereby, that price advances will bring the end sooner, and they also contend that an advancing steel market is almost certain to result eventually in higher wages. Mills might have to pay higher wages before they had completed orders taken at the old prices. Rather satirically they suggest that if mills know this, as they should, they had better advance wages at once and then they would have a good talking point—which they have not now—for advancing prices.

The advance in wire products noted a week ago, as made by several producers, is now practically general, in this way, that the majority of independents have advanced their prices while the other independents as well as the American Steel & Wire Company (Steel Corporation) are practically out of the market since they are booking business only from regular customers, and then in quite restricted fashion. This makes the market quotable at spreads, 3.00c to 3.10c on plain wire and $3.25 to $3.50 on nails.

Pipe mills have not advanced prices generally, following the example of the Wheeling Steel and Iron Company, which advanced butt weld 2½ points and lap weld 5 points on July 10, but it is reported that a number of mills are taking business at premium prices, i.e., their regular quotation is the open market but for the delivery that the buyer wants there is a higher price.

Several of the independent sheet mills

have advanced prices $2 a ton on black sheets and $4 a ton on galvanized, and in some quarters it is predicted that eventually all the independent mills will be on the advanced basis. The leading interest has made no advance and shows no sign of doing so, but even independent mill interests to cover them for the first half of 1920 it has made some sales at $5 a ton advance. Apparently it proposed this advance in the first place in order to discourage the automobile trade from buying for so late a delivery.

For all the important steel products there is as much demand as 30 days ago except in some cases where mills are [illegible] with contracts already, and then they are getting good specifications, while in some lines there is heavier demand. Lettings of fabricated steel contracts are showing a heavier tonnage almost every week, and are now running at approximately the capacity of the fabricating shops. There is increased demand for merchant steel bars from nearly all customers, and the cold drawing shops are particularly good buyers. They are running full on sizes of 3-in. and less, but at low rates on the large sizes. Forging billets are now moving in a moderate way, mills having sold several hundred tons in the past fortnight, and they state they are obtaining the full March 21 price, which is $51, Pittsburgh, or $12.50 over the regular price of rolling billets.

The pig iron market is strong in foundry grades, but Bessemer and basic are a trifle unsteady. The condition is natural as foundries are running fairly well and want their particular demands, while for Bessemer and basic there is never so much demand in the open market unless the mills are operating very nearly at capacity. There are many large steel interests that make enough iron themselves for ordinary requirements but when they are particularly rushed they have to buy some merchant iron to fill in.

Scrap

The advance in scrap prices, particularly heavy melting steel, has brought the market to a very interesting stage. Sales of United States and Canadian Government scrap were made to dealers in the past few months at prices above the current market, the dealers putting the material into stock, knowing that they could make a profit some time. Now, with ordinary melting steel advanced to $21 to $22, and with special grades like shell steel commanding considerably more, up to $25, those dealers can sell at a fair profit. If they did not sell the market would advance somewhat more as little scrap is being produced, but if any selling movement should start the dealers would probably all fall in line and weaken the market in short order. One dealer in Pittsburgh has sold 25,000 tons in the past few days, but this has not precipitated any general movement, at least thus far. The largest holder is a Cleveland dealer, who has been "sitting tight" up to date.

MONTREAL NOTES OF THE WEEK

Commissioner Ross of the Montreal Administrative Commission has notified that body that he will propose the adoption of a by-law amendment to increase tax on water consumption in breweries, hotels, manufacturing establishments, and other large business houses. The present tax is at the rate of 4 per cent. per year, and the increase, if adopted, will bring this up to 6 per cent. per year, an advance of ½ per cent. per quarter.

There will be no exhibit of the Canadian manufacturers at the Athens fair on September 15. It has been decided the notice was too short for anything but a Government exhibit, but arrangements are being made between the Government and the Canadian Manufacturers' Association for future exhibits to be made at short notice in connection with the Dominion's bid for European trade.

An interesting sight is to be seen in the Montreal harbor just now, in the steamer War Dream, a development of the shipyard of Harland and Wolff. The design was intended to deceive the German U-boats, but unfortunately were not put into commission until the war had ceased. The sides of this vessel, instead of being rounded, are straight slopes, which permits of a plate being easily inserted in case of damage. It gives the stern the shape of a V. She is taking on freight for England.

The Federal housing scheme has again been revived in this district. A further and definite step has been taken in the appointment of a technical commission of three members, who will be associated with Dr. Emile Nadeau, provincial director of housing. The three members that have been mentioned for this work are: F. G. Todd, Montreal, architect; Wilfrid Lacroix, Quebec, architect; and Theo J. Lafreniere, Montreal, sanitary engineer. This commission will act under the direct supervision of the provincial director, and their task will be to draw all the plans for all the municipalities for the various classes of houses that will be built from the $7,000,000 allotted to the Province of Quebec of the $25,000,000 that the Federal Government is loaning for the purpose.

W. J. Sutcliffe has been appointed assistant auditor of freight and telegraph receipts of the Canadian Pacific Railway. He will succeed J. Bonner, who has been retired on a pension. Mr. Sutcliffe has been in the services of the C.P.R. for the past 19 years, starting in the same department in which he is now assistant chief.

Regular passenger service between the ports of Montreal and Havre commenced on the first of this month, when the steamer "California" of the Compagnie Canadienne Transatlantique docked here with 280 passengers. The "California" is a vessel of 9,000 tons, and will leave on her return trip on the 7th inst.

There is every likelihood that a fuel commissioner may be appointed to negotiate with the Americans for the protection of Canadians in respect to the supply of coal for the coming fall and winter. An informal gathering of manufacturers in the Montreal district has taken place to discuss this matter, with the result that a resolution was passed for the petitioning of Ottawa for the re-establishment of a fuel controllership.

After forty years of continuous service with the Grand Trunk Railway, W. D. Hannah, chief fuel inspector of the company, has been retired on a pension. On the occasion of his retirement, Mr. Hannah was presented with a purse of gold by his fellow employees in the stores and purchasing departments.

Heavy rains during the early part of last week was the cause of serious floods in the vicinity of St. George and Beauceville, Quebec, and caused the River Chaudiere to rise considerably, and fears are entertained that floods similar to those of last year will occur should further storms follow.

HAVE PURCHASED THE BIG TRENTON PLANT

Briggs & Turivas, Chicago and New York, dealers in iron and steel scrap and salvage, have purchased from the Imperial Munitions Board of Canada the entire plant and property of the British Chemical Co., Ltd., located at Trenton, Ont. A Canadian corporation under the name of Briggs & Turivas of Canada, Ltd., and capitalized at $1,200,000, has been formed, with main offices in the Canadian Pacific R. R. Building at Toronto, Ont., and a branch office at Trenton, Ont. The property consists of 255 acres and fronts the Trenton River, a navigable stream. Three trunk line railroads enter the plant. The British Chemical Co. was formed and built during the war at an outlay of approximately $8,000,000. The equipment consists principally of two separate and complete sulphuric acid chamber plants, sulphuric acid concentrators, a nitric acid plant, an alcohol rectifying plant, two refrigerating plants, a smokeless powder plant, a complete high pressure fire system, two miles of narrow gauge trackage with electric locomotives and trucks, two boiler houses, electrical equipment, warehouses, storage tanks, administration building, etc. The new owners are as yet undecided as to the extent of the operations of the plant for the future, but it is expected that the powder manufacturing apparatus and equipment, and possibly the nitric acid plant, will be dismantled and disposed of, allowing the sulphuric acid plants to stand.

The Pressure Proof Rings, Ltd., has been incorporated with a capital stock of $100,000, divided into 1,000 shares of $100 each, the head office to be in Sherbrooke, Que. The company will manufacture piston rings, packing, etc.

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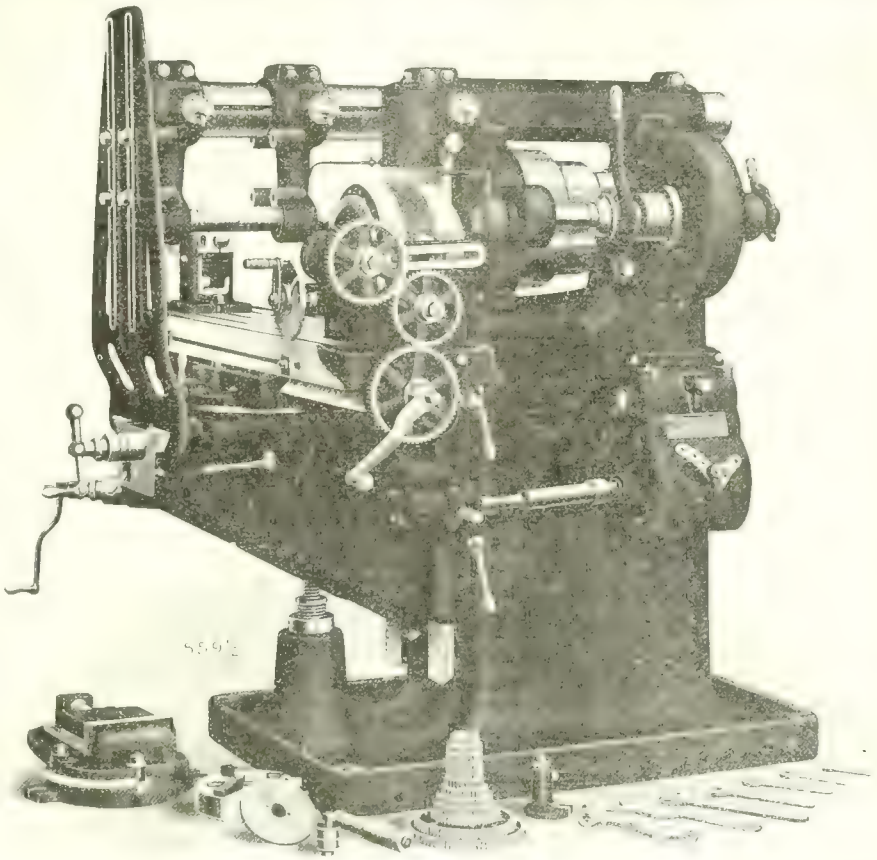

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SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	.....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$27 00	$27 00
Electro copper	26 00	27 00
Castings, copper	26 00	25 00
Tin	57 00	58 00
Spelter	10 00	10 00
Lead	7 25	7 00
Antimony	10 50	10 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$17 00	$13 75
Copper, crucible	21 50	18 00
Copper, heavy	21 50	18 00
Copper wire	21 50	18 00
No. 1 machine composition	18 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	16 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	9 00	7 00
Medium brass	10 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	5 00	5 25
Tea lead	4 00	3 50
Aluminum	18 00	18 00
	Per Ton	Net
Heavy melting steel	14 00	13 50
Shell turnings	7 00	6 00
Boiler plate	14 00	11 00
Axles (wrought iron)	20 00	20 00
Rails	20 00	13 50
Malleable scrap	16 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe wrought	11 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20,
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

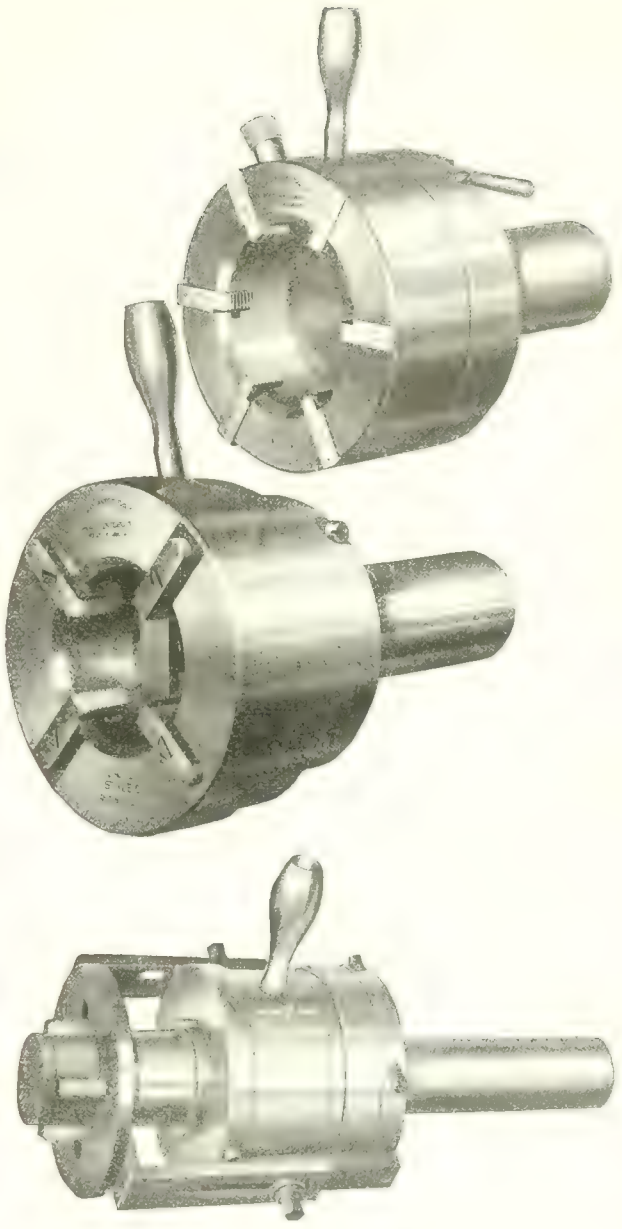
POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

A Good Boon

"Geometric Tools are a boon in our business. Always reliable and sure of turning out a class job; in fact, I don't know how we could secure a decent output without them."

This is what the Works Inspector of a London (England) shop says. He adds that they are making screw and small parts for air craft, and have quite a lot of Geometric Dies in constant use.



Because of the fact that Geometric threading tools are "a good boon" in the thread cutting business, the majority of screw machines and turret lathes are equipped with Geometrics.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN, CONN.

Canadian Agents:

Williams & Wilson, Ltd., Montreal.
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

For any thread, any size, any pitch—there's a Geometric Collapsing Tap or Self-Opening Die Head. Be assured there is one to meet your particular threading need—whatever it may be. Ask us.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb	0 58
Lead wool, per lb.	0 14
Putty, 100 lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sies up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40 plus 10
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill ..... list plus 5%
At warehouse ..... list plus 25%
Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	.....	.....
Queen's Head, 28 B.W.G.	.....	.....
Fleur-de-Lis, 28 B.W.G.	.....	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28 U.S.	.....	7 50
Premier, 10¾ oz.	.....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅝ in., $9.60; ¾ in., $9.70; ⅞ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B. ⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11
Dark colored	09
Mixed colored	10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.15
Ammonium carbonate	...
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.25
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	.75
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	.80
Zinc chloride, C.P.	.80
Zinc sulphate	.15

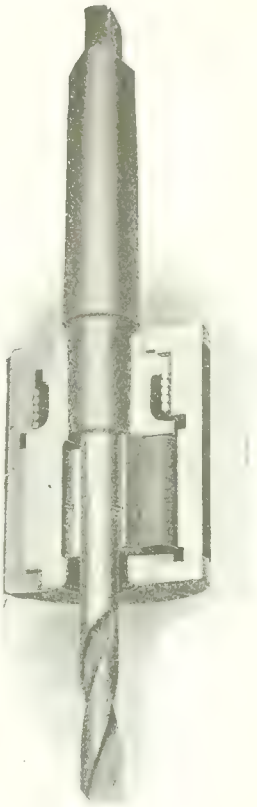
Prices per lb. unless otherwise stated

Use
Wahlstrom
Chucks

POSITIVE DRIVE
AUTOMATICALLY
SELF-CENTERING
NO SLIPPAGE

Aikenhead's

Wahlstrom
Attachment



Speed Up Production in Your Machine Shop

Consider the merits of an automatic chuck that keeps the spindle of every drill press running without a second's stop.

Calculate the money value of the minutes saved by the Wahlstrom chuck each time a tool is changed.

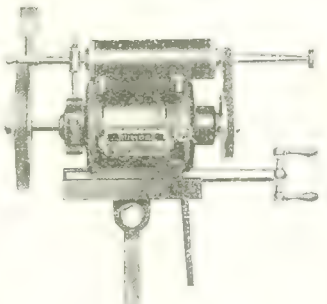
The Wahlstrom chuck—not the operator—centres the tool perfectly. It enables the operator to make tool changes in less than two seconds. Spindle of machine never stops. And there is absolutely no delay because of tool slippage. For no tool gripped by the jaws of a Wahlstrom chuck can slip. If the resistance on the tool is great, the holding power of the jaws increases.

Send for Bulletin

Aikenhead Hardware Co., Limited
17, 19, 21 TEMPERANCE STREET - TORONTO, CANADA

Aikenhead's

DUMORE
ELECTRIC
GRINDERS

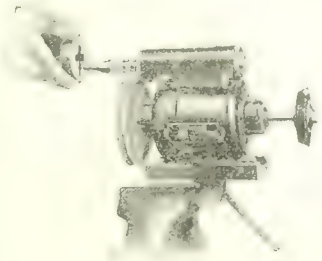


EQUIPMENT A

Invaluable for Accurate Grinding of Tools

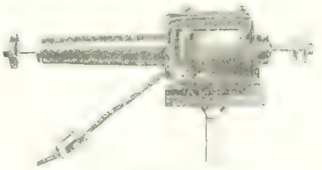
These grinders are designed to meet the requirements of the manufacturer who desires a light grinder which will do accurate work, and at the same time does not wish to invest in a large and more expensive tool. The Dumore grinder can be quickly attached to lathes or other machine shop equipment. Their scientific construction entirely eliminates vibration and work done is accurate and free from chatter marks.

Write to-day for descriptive literature.



EQUIPMENT C

Button Die Grinder. Speed, 50,000 R.P.M.



EQUIPMENT B

Deep Internal Work. Speed, 30,000 R.P.M.

AIKENHEAD HARDWARE, LIMITED
17 TEMPERANCE ST., TORONTO

LOOKS LIKE A HIGHER 1920 PRICE

THE market for pig iron keeps active and prices firm. Buying for 1920 delivery has taken place at much higher than present levels. Following are reports from various United States points.

CHICAGO.—Repeat orders have been a feature of the market here, one customer purchasing 1,500 tons after making a purchase of 1,000 tons to carry him over the year. An order for 15,000 tons for first half of 1920 has been booked by a leading seller, at $2 per ton over present prices. Most of this was malleable.

BOSTON.—Boston agents report sales amounting to 7,000 tons, not including a 5,000-ton order booked direct at furnace for the Crane Co. Some business has been placed for last quarter and first quarter of next year combined, but there is little enquiry for 1920 business. 1.75 to 3.25 silicon iron has been sold for $32 furnace last quarter.

NEW YORK.—The market is strong, with enquiry very active, and sales good. The export market is being canvassed, but high freight rates and unfavorable exchange are against business. A large interest closed an order for 10,000 tons, and is said to be in the market for another 10,000.

PITTSBURGH.—Steel making and foundry grades are being enquired for, and No. 2 foundry has been sold at an advance of $2 per ton, for last quarter. Only one booking for next year is reported, for 8,000 tons railroad malleable distributed between three or four furnaces. Low phosphorus is quoted at $39 to $40 valley furnace for copper-free iron.

PHILADELPHIA. — Business continues brisk, and prices tend to stiffen. The Worthington Pump Co. is enquiring for 7,000 tons for last half and first half. The Roebling Co. bought 10,000 tons among different makers, the price being from $26.75 to $27.75 delivereed.

BUFFALO.—The furnace capacity still available is rapidly being booked up. Next year's business is not being looked for. Enquiries during the week have been brisk, and actual bookings amounted to about 25,000 tons.

CLEVELAND.—Selling has been quite lively, in some cases the business for July having exceeded June, which was a very heavy month. One interest reports sales amounting to 20,000 tons, some for first half next year delivery. Makers generally are not inclined to book business for next year.

CINCINNATI.—Business seems to have been enlivened by the firm stand taken by makers in regard to price. Southern iron has been sold for $28, Birmingham, but $26.75 for prompt shipment on 1.75 to 2.25 silicon can still be obtained.

ST. LOUIS.—Foundries are consuming a large amount of iron, but are mostly covered up to the end of the year, and producers are not offering iron for next year delivery. The signs are for an advance in prices.

BIRMINGHAM.—Furnaces here are being blown in, and production will be increased as fast as possible. Inquiries are good, and makers believe that the output can be sold with little difficulty, and prices will increase.

THE FERRO-ALLOYS

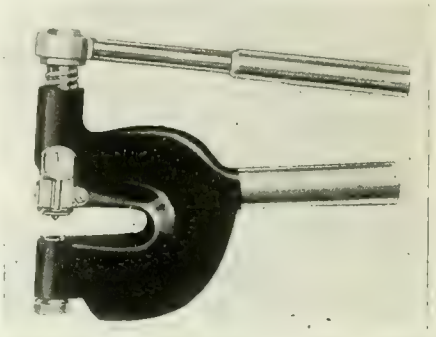
A large industry has grown up within the last fifty years, most of it within the last twenty-two years, which furnishes steelmakers alloys of iron with some of the rarer metals. It is quite commonly known that the addition of these metals to steel greatly improves its qualities for special purposes. These ferro-alloys were originally made in crucible, cupolas, or blast-furnaces, but are now made principally in electric furnaces, and their manufacture is now one of the principal electric-furnace industries. They are of great importance to the steel industry. The steelmaker uses them for one of two purposes: (1) As reagents to take oxygen out of melted steel, and thus ensure sound, solid casting. For this purpose ferromanganese, ferrosilicon, and ferroaluminium are employed. (2) To add to the steel a small or large percentage of the rare metals, ferromanganese, ferrochromium, ferrotungsten, ferromolybdenum, ferrovanadium, ferrotitanium, ferrouranium, ferroboron.

Melted steel, just before it is taken from the furnace, always contains some dissolved oxygen (like the dissolved gas in charged soda water). The addition of a small amount of metal with a high affinity for oxygen removes this element, and makes the casting sound. Manganese (1 per cent. or less) is the cheapest and most generally used reagent; silicon (½ per cent. or less) is more powerful, but also more expensive, and is often used to supplement the action of the manganese; aluminium (0.1 per cent. or less) is still more powerful and expensive, and is used in very small quantities as a final addition to complete the action of the manganese and silicon. All steelmakers use one, two, or all three of these reagents—manganese and silicon in the form of ferro-alloys; aluminium more often as the pure metal, though ferroaluminium is sometimes used.

When a sufficient quantity of the rare metal is added to the steel, it acquires properties different from plain carbon steels, deoxidized by manganeses, silicon, or aluminium. Thus, a very tough, hard steel, such as is used in mining and grinding, burglar-proof vaults, etc., may be made by the addition of 12 to 14 per cent. of manganese. Chromium (2 to 4 per cent.) makes a very hard tool steel; tungsten (15 to 25 per cent.) makes a high-speed tool steel, which, while red hot, cuts iron. Vanadium (0.1 to 0.5 per cent.) makes a very strong steel, which resists shock extremely well, as when used for automobile axles; titanium, uranium, and boron also impart valuable properties. Every one of these materials produces some specific result; sometimes two, three, or four are used for producing a specific combination of special properties. Some of these materials cost 20s. per pound, and special steels produced up to 10s. per pound.—"General Electric Review."

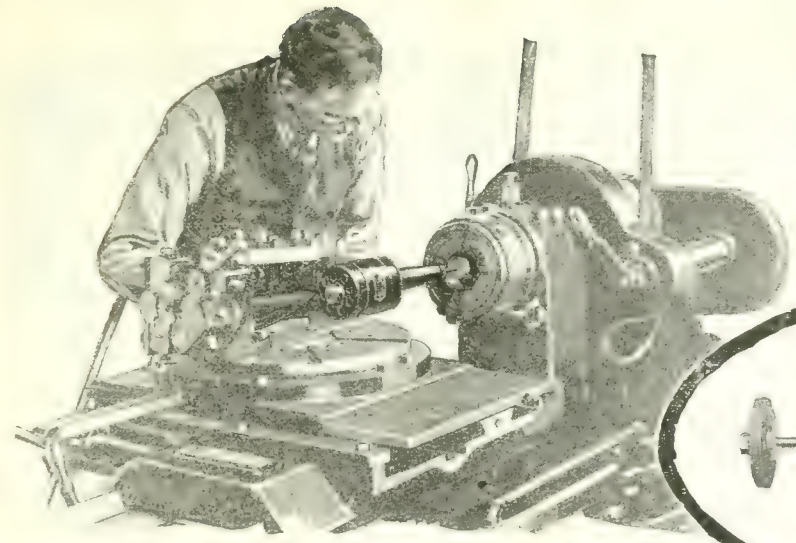
KOCH HAND PUNCH

THE tool which forms the subject of the following description is known as the "Jiffy" hand punch, and it is a recent product of Paul W. Koch & Co., 19 S. Wells St., Chicago, Ill. This tool is adapted for use in places where space is limited, and its capacity is for punching holes 5-32, 3-16, 7-32, and 1-4 inch in diameter, in metal up to 10 gage. It will be apparent from the illustration that the punch is provided with a deep throat, and it is equipped with an automatic stripper which is so designed that it does not prevent the operator from gaining a clear view of the punch and work. Several sheets can be punched at one time with this tool. A crowned punch of the floating type is used, which directs power to the center and is so arranged that it will not twist and turn in operation, so that there is little danger of breaking the punch. Also, it is stated that the hole is clean-cut and that there is no tendeny to leave a burr on the metal, half turn of the lever being required to drive it through the metal. This tool is 9-12 inches in length and weighs five pounds.



GENERAL APPEARANCE OF THE PUNCH.

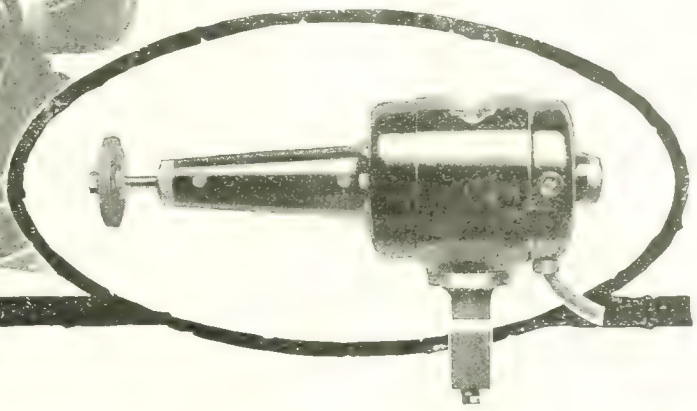
In the power house of the Interborough Rapid Transit Co., New York, is what is claimed to be the world's greatest prime mover. This is a cross compound turbine, consisting of a high pressure and two low pressure elements, the capacity of the whole unit being 60,000 kw. continuously, and 70,000 kw. for one hour. The floor space occupied is 52 x 50 feet, and the height about 19 feet. The high pressure turbine receives steam at 205 lbs. gauge and 150 degrees superheat, and the exhaust is divided equally between the two low pressure turbines. Each element operates at 1,500 r.p.m., driving a direct connected generator of 20,000 kw. capacity, three phase, 25 cycle, 11,000 volt.



Dumore No. 1 Grinder

Sturdy
Dependable
Accurate

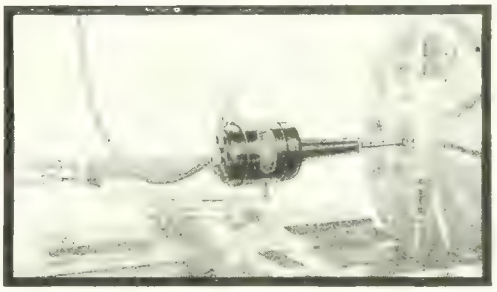
40.00 Complete

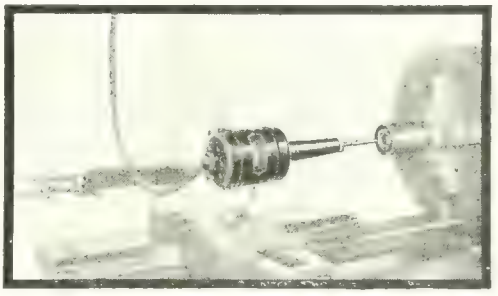


THERE is no doubt of the value of the **Dumore No. 1 Grinder.** No other tool, at or anywhere near its price, can give a greater amount of actual, accurate daily service.

Because jigs, dies, gages, bushings, etc., will always warp during tempering, thousands of mechanics use the **Dumore** grinder to bring these tools to as close limits as .0001″. Such a degree of accuracy is possible solely because the **Dumore** is perfectly balanced throughout and operates at the correct cutting speed.

We have some very interesting literature for men facing grinding problems —write for it.





WISCONSIN ELECTRIC COMPANY
2914 SIXTEENTH STREET
RACINE, WIS.

DUMORE HIGH SPEED GRINDERS

Brief Bits of News From Many Sources

A considerable vein of pitchblende, from which radium is extracted, has been discovered near Buckfastleigh, in southern Devonshire, England. The ore yields over 26 per cent of uranium oxide, and the lode will be developed immediately.

* * *

A very effective dust catcher for surface grinders consists of an iron bracket, to which is bolted a broad piece of sheet metal, with a water pan or trough built on at the bottom. A piece of heavy cloth, or burlap, is hung over the sheet-metal surface, long enough to reach down into the water trough. The burlap soaks up the water like a wick, and is always kept wet. Emery dust and small metal particles thrown against it are caught and kept from flying around the shop.

* * *

When the race of an automobile ball or roller bearing works loose, the surrounding metal may become so badly worn that even a new race fits loosely. In such a case the worn surface can be built up with solder until it makes a tight fit, and the bearing can then be forced into position with a hardwood punch. Loose dust caps can be fixed in the same manner.

* * *

Wealthy tourists to St. Moritz, the world-famous Swiss winter and summer resort, may soon be able to make the trip from Zurich in one hour, instead of the seven or eight now required by the railroad. Capitalized at about $100,000, a company has been formed to back the 90-mile airplane line, and has already announced that service will be inaugurated during the year with tickets selling at about $100. Many will doubtless be willing to pay this price, if for nothing but the matchless view of mountains, lakes, and glaciers.

* * *

Liquids and solids do not ordinarily mix, and the idea of combining coal and petroleum to make a new fuel sounds rather chimerical at first. Yet that very thing has been done, and successfully, by pulverizing the coal so finely that it forms a colloidal, or suspended, mixture with the oil. This compound passes freely through all regular oil pipes and burners, so that it can be used for power and heat without equipment change; and it generates a greater heat value than oil alone. Coal dust, passed through a 200-mesh screen, mixed with a little tar in the oil, leaves no deposit even after months. Use of the new fuel in place of fuel oil on sea and land would save millions of barrels of oil a year.

* * *

A newly developed steel that seems particularly desirable for dies, taps, and other cutting tools, changes its form so little during the hardening process that castings have the appearance of smooth forgings, and need almost no machining. The texture is uniform and close-grained, and castings may be subjected to high temperatures without scaling. Because of this heat-resisting property it is claimed that the walls of annealing boxes may be made much thinner with this material, and that the original shape and weight is retained through many more firings than when malleable or cast iron is used.

* * *

Pottery ware which is to be subjected to kiln fire is placed in rough clay boxes, called "seggars." Ordinarily made by hand, these articles can now be turned out by an electrically-driven press, which increases the capacity of a man and helper about tenfold. The operator places a piece of plastic clay in the mold, pushes it under the press, and moves the lever forward. The screw brings the top plunger down, and presses the seggar; after which the machine reverses itself and comes to a stop at the proper height. Pulling the mold back, the operator pushes out the seggar by means of the geared ejector. The helper carries the finished product to the drying room, from which it is delivered ready for use.

Two men could make by hand about 60 or 70 seggars, but it is claimed that with this machine the output may go as high as 1,000 a day. Much coarser materials may be used than with the hand presses.

* * *

A novel kind of lock nut, which cannot be accidentally loosened on the bolt, but is readily removed with a wrench, has been designed by a woman inventor. A recess in the top of the nut is shaped at the bottom like a shallow spiral stairway. The nut is turned onto the bolt, and a short cotter pin is inserted through a slot in the bolt. Tightening the nut engages the pin with the notches or "stairs" of the recess, which position it holds until forcibly disengaged. With the cotter pin removed it acts as an ordinary nut.

* * *

THIS is the season of the year when the $10-a-week chap makes a sensational splash at the $40-a-week summer hotel.

* * *

IN CHICAGO blacks are bowling over the whites, and the whites are asking the blacks to leave the premises feet first with a bunch of flowers on top of the heap. Sort of putting things down in black and white.

* * *

MANY people spend a great deal of time wondering why the Government, or some other organization, does not go ahead and deal with the cold storage. We heard of one man who spent three days going around getting signatures to protest against storing eggs. The same amount of effort, together with a crock and some water-glass, would have given this well-purposed chap a cold storage plant of his own, and would have made the doings of the cold storage people a matter of indifference to him.

* * *

UNITED Mine Workers of America have revoked the charter of District 18, taking in Alberta and British Columbia, because officials have joined in with the One Big Union. Officials of District 18 have for years been eager to grasp onto and embrace anything and everything in the line of radical action. They have succeeded now in getting themselves alienated from one of the most powerful and sanest labor organizations in the continent.

HAVE YOU LOTS OF FRIENDS?

By H. J.

If you have, then all is Jake, as the saying goes.

If you have not—then something is out of kilter.

Is this your trouble?

Are you inquisitive, and keep sticking your nose into other people's business?

Do you repeat all the gossip tales you hear of?

Did you ever haw! haw! at some religious belief you've heard suggested?

Do you carry a grouch around with you?

Have you ever knocked someone, simply because they possessed some quality you haven't got yourself?

Do you tell your troubles, and speak of your aches to every Tom, Dick and Harry that you meet?

Do you try to convince everybody that this old world is all built wrong, and that you've been lost in the shuffle?

If you have spilled any of the above remarks from time to time—no wonder your friends are few.

ILLINOIS

CUTTERS
REAMERS

None better can be made.

ILLINOIS TOOL WORKS, CHICAGO.

Detroit Store
Woodward and Warren Aves.

A. C. Towne, Inc.
17 W. Swan St., Buffalo

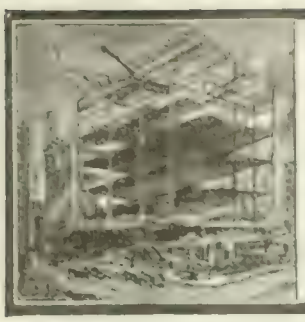
S. J. Pfaff
Pioneer Bldg., St. Paul.

Rose Tool and Supply Co.
111 Market St., Pittsburgh

Louis G. Henes
75 Fremont St., San Francisco
Title Insurance Building
Los Angeles

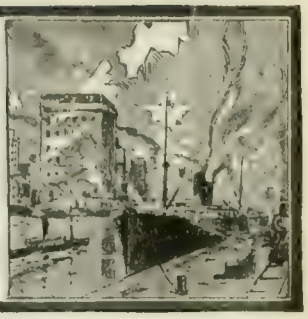
Indianapolis Office
610 Fletcher Sav. & Trust Bldg.

New York Office
141-145 West 36th St.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



OBITUARY

The death of Capt. Murphy, at the age of sixty years, is reported from Kingston. Capt. Murphy was a son of the late James Murphy of Kingston. He was for many years a pilot on the St. Lawrence.

Mr. Robert M. Cox, of Liverpool, England, and Ottawa, died at his Ottawa residence, 381 Stewart street, in his 83rd year. He had been interested in the lumber trade in the Ottawa district for the past 45 years, and was an esteemed member of a large circle of friends. He visited England for part of each year since he started in business, forty years ago.

PERSONAL

A change in the management of the Union Carbide Company, Welland, is announced. Mr. John White, who has been manager of the Welland plant since its inception five years ago, goes to the company's plant at Sault Ste. Marie as manager. He will be succeeded by P. F. Gormally, at present assistant manager at the Soo.

The Senior Trade Commissioner for Canada and Newfoundland, Mr. G. T. Milne, is being transferred to Havana, Cuba, as commercial secretary to the British Legation in that city. No announcement has yet been made as to his successor.

TRADE GOSSIP

New Waterworks for Chatham.—The present water system of Chatham being unsatisfactory, it has been decided to build a new plant at a cost of $250,000.

Newfoundland Imports Free. — The last restrictions on imports into Newfoundland have now been removed, by flour being restored to pre-war conditions.

Algoma Steel to Extend—The Algoma Steel Co. will spend several hundred thousand dollars in making extensions to their mills, to enable them to manufacture structural steel up to 32 inches.

English Firm For Hamilton.—The firm of Perrits & Spencer, Bury, England, will build a factory in Hamilton at an approximate cost of $600,000. W. J. Westaway has been appointed engineer for the building.

Purchase Coal Handling Plant.—The coal handling plant on the Canadian National Railway terminals at Halifax, has been purchased by the Nova Scotia Steel & Coal Co. from the British Ministry of Shipping.

Chatham Buys Asphalt Plant.—The city council of Chatham has bought an asphalt plant at a cost of $18,000. The plant will be delivered in about five weeks, and work will be immediately started repairing the streets.

Military Hospital Expands.—The Ontario Military Psychiatric Hospital is to have five additional buildings. Two will be for recreation, one for isolation, one for tuberculosis and one for the vocational re-education branch.

New Smelting Plant.—The forthcoming industrial congress at Calgary will consider the establishment of a smelting plant near that city, the new process of smelting by electricity to be employed. Considerable interest is being displayed already.

Strike at Lauzon.—About 900 men at the Davey Shipbuilding Co.'s plant at Lauzon, near Quebec, walked out on strike. The men belong to the International Union, and the strike is for recognition of the Union. The yards employing National Union men are still operating.

To Inaugurate Sunday Service.—The Grand River Railway Co. will commence a Sunday service covering all points on the line. This will give a two hour service connecting Kitchener and Hespeler, and the C.P.R. at Galt will give connection with the Lake Erie and Northern Railway to Port Dover.

Electrifying Montreal Harbor.—The Montreal Harbor Commissioners have awarded contracts for material required in the electrification of the railways on the wharves. Work will be started as soon as material is available. A generator set will have to be installed, the rails bonded and poles and wires erected.

Collingwood Strike Over—The Collingwood Shipbuilding Co.'s men, who have been on strike for the last two weeks, have returned to work. The men went out owing to the dismissal of some of their number who failed to turn to on July 12, in defiance of a notice that any man absenting himself on that day would be dismissed.

Openings in South Africa.—There are good opportunities for Canadian manufacturers to get markets in South Africa, according to Mr. S. P. Morgan, of Cape Town, who is now in the country. South Africa imports nearly every line of goods that Canada produces.

Credit Company Appoint Agents.—Messrs Weber Bros., McLeod block, Edmonton, have been appointed agents of the Commercial Credit Co. The company, which is an old established organization, is engaged in financing sales of tractors, trucks and autos on a time basis.

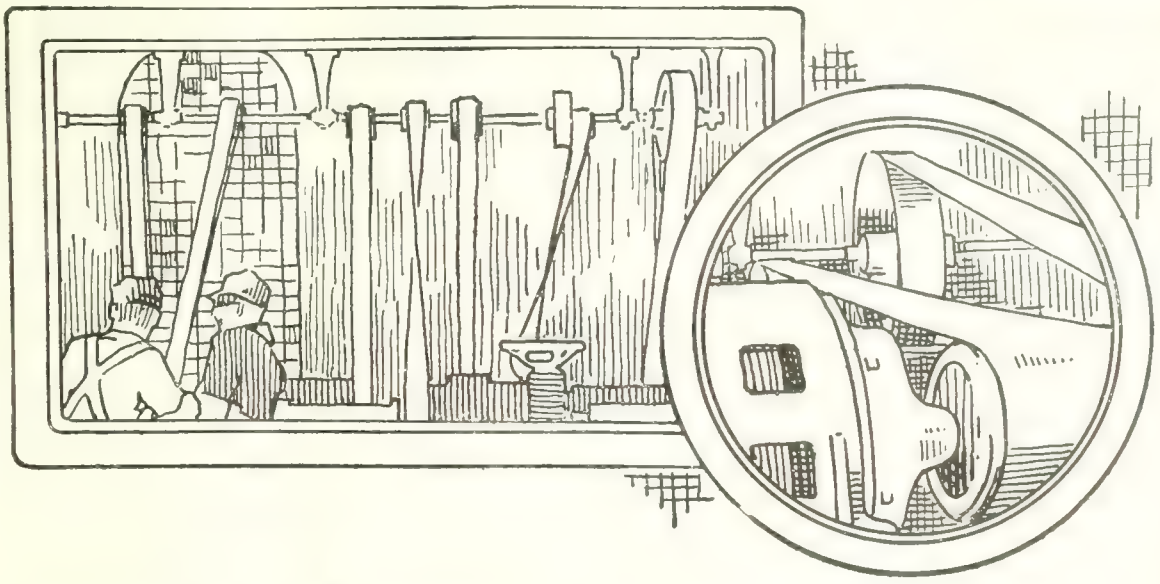
Manufacturers Want Controller.—At a meeting of manufacturers from the Montreal district, the appointment of a fuel controller to negotiate with American authorities for the procuring of coal for Canada at reasonable prices was discussed. The feeling was that the coal situation was very serious, and if factories were not to be shut down next winter, every effort should be made to get coal now.

New Industry for Hamilton. — The Carr Fastener Company of Boston, Mass., are to open a factory in Hamilton. This firm are said to be the largest manufacturers of fasteners in the world. The Hamilton branch will be known as the Canadian Carr Fastener Company, and will be probably capitalized at $250,000. Two and one-half acres of land on Gage avenue have been purchased.

U. S. Firms Looking to Canada.—A large number of American firms have been communicating with the Alberta Industrial Congress, Calgary, on the subject of locations for Canadian branches. Among these are the National Cycle Manufacturing Co. of Bay City, Mich.; the Marchant Calculating Machine Co. of Oakland, Cal.; Edgar M. Moore Co. of Pittsburgh; Cardwell Machine Co. of Richmond, Va., and many others.

Heavy Shot at Chippewa.—A dynamite charge that cost between $4,000 and $5,000 took place at Chippewa recently. The amount of dynamite used in the blast was in the neighborhood of ten tons. It was used in opening up a large section of rock in the forebay of the new development canal above Queenston.

Increase in Receipts.—The customs receipts on imports from the United States show a large increase in the last month, according to the figures issued from the Customs Office. The actual amount for the month is $3,083,243, against $2,698,513 for July 1918. Mr. J. H. Bertram, collector for the port of Toronto, stated that it was the biggest month ever known at this season of the year.



Low Up-Keep Cost of Dominion Friction Surface Belting

Cost of maintaining equipment in the average plant is seemingly so small when compared with other costs that it is seldom considered seriously, but when totalled at the end of five years, represents a far greater expense than actual necessity demands.

Maintenance of belting is in itself an important item, because each répair means idle employees, idle machines and less production, the total cost of which is often greater than you would pay for better belting.

Dominion Friction Surface Belting is built for "service first" that its long, continuous performance may eliminate the necessity for repairs and replacements.

But it gives an added service in conserving power—the rubber that goes into it is a special friction compound that prevents practically all slipping on the pulleys even under quick load changes.

Our belting experts are ready to help lower your maintenance costs on belting and can suggest changes that will lower your production costs.

A phone, wire or letter to our nearest service branch, places at your disposal, without obligation or charge, not only their services but the entire facilities of the oldest and largest rubber organization in Canada.

CANADIAN CONSOLIDATED RUBBER CO. LIMITED
DOMINION RUBBER SYSTEM
AND ASSOCIATED COMPANIES

Makers of
Dominion Hose, Packing and Industrial Rubber Goods and Dominion Tires, the GOOD Tires for every purpose.

Service Branches

Halifax	Fort William	St. John
Winnipeg	Quebec	Brandon
Montreal	Regina	Ottawa
Saskatoon	Toronto	Edmonton
Hamilton	Calgary	London
Lethbridge	Kitchener	Vancouver
North Bay	Victoria	

To Use Dominion Lumber.—The heavy stocks of timber purchased by the British Government during the war are to be shipped over to England as fast as space can be provided for them. The material will be used for house building, the lack of houses being one of the principal causes of industrial unrest.

A Fortune in Oil.—Mr. Kenneth Johnston, a former Sarnian, but now of Buffalo, is the inventor of a lubricating grease, which has been taken up by one of the largest oil companies in the United States. The sum paid to Mr. Johnson for his invention is said to be $600,000. He is a veteran of the South African war.

Strike is Settled. The Peilson Iron Works have affected a settlement with the various unions employed by them, an dthe me nhave returned to work. The men withdrew their demand that the company should recognize the Marine Trades Federation and the Marine Council. A 47 hour week has been conceded and wages raised.

Better Output for Sydney.—The output of coal for the month of July, as shown by the records, has increased at Sydney, C.B. The highest output was obtained by the Florence Colliery with a figure of 16,000 tons, the Princess Colliery coming next, with 13,000 tons. Scotia had a decrease but this was

Newmarket Boiler Explosion.—At the inuest into the boiler explosion which caused the death of five persons recently in Newmarket, evidence was given to the effect that the water used in supplying the boiler was high in sodium carbonate. The analysis of the water coincided with that of the water in other districts where the embrittlement of plates by the action of sodium hydroxid has occurred. The water is from an artesian well on the premises. The ton supply and ahe Office Specialty Supply Co. suply were found to be free from sodium carbonate.

Locating in Hamilton.—The Carr Fastener Company of Boston, Mass., the largest manufacturers of metal fasteners in the world, have completed arrangements for the immediate establishment of a large Canadian branch of their industry in Hamilton, Ont. A two and a half acre site in the heart of Hamilton's manufacturing district has been purchased, and building operations are to be commenced at once. The Carr Fastener Company is capitalized at a quarter of a million dollars, and the buildings to be erected will cost in the neighborhood of $100,000. The Canadian plant will give employment to upward of 200 hands almost immediately, and it is expected that this number will ultimately be increased to 400 or 500. The Carr Company are the manufacturers of the "Lift the Dot," "Durable Dot," "Voltex Dot" automobile fasteners, as well as the "Common Sense" and other lines. In addition to supplying the Canadian automobile and other trades from Hamilton it is the company's intention to have its Canadian plant supply the export trade. Building operations are to be rushed, and the company expects to be manufacturing in its Hamilton plant before December 1.

Municipal Power for Port. Colborne.—Port Colborne decided by a vote of 141 majority to purchase the distribution system of the Ontario Power Company in Port Colborne.

Record Ship Deal.—What is probably the largest sale of ships ever recorded took place when the U. S. Shipping Board sold one hundred steamers built on the Great Lakes during the war for $8,000,000. The purchasers were the Anderson Overseas Corporation of New York. Delivery of the ships will be commenced early in August and proceed at the rate of six or more per week till completed.

Longest Bridge in the World.—A bridge is under consideration between Windsor and Detroit, which will be the longest in the world if erected. The length would be 2,590 feet, 1,090 feet longer than the span of the Brooklyn Bridge. Mr. W. H. Adams, the engineer for Detroit, informed Mayor Winter that the cost of such a suspension bridge would exceed the cost of a tunnel.

Parrsboro.—The schooner, Jennie V. Merriam, was launched from the Port Greville yard of George Wagstaff. She is a fine tern schooner of 454 tons register and is classed for thirteen years in Bureau Veritas. She is fitted with power for hoisting sails and anchor, and is lighted throughout with electric light. Greville for England. Mr. Wagstaff has another schooner under way for other owners.

C. M. A. Meeting.—The Canadian Manufacturers' Association, Maritime branch, held a meeting at Bathurst with President Angus McLean in the chair. A delegate in the person of H. R. Thompson, the secretary, was appointed to attend the trades congress at Calgary next month. It was decided to approach the Provincial Government with a view to having a similar congress for the Maritime Provinces next year. The Trade and Commerce Department will be requested to arrange for visiting British journalists and other British delegates visiting Canada to call at the commercial centres of the Maritime Provinces. through having three or four idle days due to an electrical breakdown.

INCORPORATIONS

The Merchants Realty Corporation has been incorporated with a capital stock of $2,000,000 in 20,000 shares of $100 each, with head offices in Montreal, to carry on a general real estate business.

The Canada Stoker Co., Ltd., has been incorporated with a capital stock of $40,000, divided into 400 shares of $100 each, the head office to be in Galt, Ont. The company will carry on a general business.

The Phoenix Construction Co. has been incorporated with a capital stock $100,000 in 1,000 shares of $100 each, and head office sin Montreal. The company will carry on business as manufacturers of metal products, etc.

The London Clay Products Ltd. has been incorporated with a capital stock of of $50,000 in 500 shares of $100 each, the head offices to be in London. The company will manufacture all kinds of sewage pipe, tile, etc.

The charter of the Ames Holden McCready Co. has bee nextended to include the promoting and holding of shares in any subsidiary or allied company with similar objects, and to finance and generally assist or guarantee the performance of contracts by any such company.

A hardening solution for concrete floors that prevents dusting, says "Concrete" is made from sulphate of alumina and acidulated water. To 10 gallons of cold water add 1 fluid ounce of sulphuric acid. Heat the liquid to boiling point and stir in 25 lb. of sulphate of alumina, then let the solution cool and strain. The concrete surface to be treated must first be swept and thoroughly washed. After drying, the hardener is put on in four applications of varying strength, ranging from 30 per cent. solution and 70 per cent. water, up to 100 per cent. solution. The above quantity suffices for the complete treatment of an area of from 50 square yards to 100 square yards, depending upon the porosity of the surface treated.

The Navy Department has adopted an audio frequency signal for aviators which will enable them to land with safety in a dense fog or in the dark. This system of audio transmission which has been perfected has played a conspicuous part in the war and is now being applied to the uses of peace. It will be of advantage to navigators finding their way through fog into port, as well as to navigators in the air. The difficulties encountered because of fog in the recent transatlantic flights of the NC-4's and the Vickers-Vimy airplane demonstrates the need of just such a device.

RECLAIMING TOOL STEEL

All the tool steel over the entire Atchison, Topeka & Sante Fe Railroad is reclaimed, all such steel being returned to the Topeka shop for general inspection, the portion considered serviceable being held in reserve to be made up into small tools. The practice with regard to short lengths of high speed steel is to make tips for lathe and planer tools, although a certain part can be used with patented tool holders. The tools on which the high speed steel tips are applied are of ordinary tire steel. The tips are faced with Norway iron, and welded to the recessed tool ends by the oxy-accetylene process. These tools are said to have proved very satisfactory in service, and made possible the continuous operation of many of the tools which would have had to close down for want of the tool steel which was difficult to secure under war conditions.

TENDERS

The Ontario Department of Public Highways is calling for tenders, which must be delivered not later than Friday, August 8, for the construction of substructure of Odessa bridge. The work consists of concrete abutments, roadway and sidewalk floors, and other necessary work in the building of a bridge over Mill Creek in the village of Odessa.

The Board of Control, Toronto, is calling for tenders for the erection of partitions, etc., in the Rendering House at Toronto Municipal Abattoir, to be addressed to the chairman, Board of Control, not later than August 5. Plans and specifications can be obtained from the city architect, City Hall.

The township clerk, London, will receive sealed tenders up to noon, August 4, for the excavating of Oxbow Creek drains, estimated cost about $10,000. Plans and specifications can be obtained from the Township Clerk, London.

The Board of Control, Toronto, require tenders for all trades in connection with the building of an implement shed at the Men's Municipal Farm near Thornhill, Ont. Tenders addressed to the Chairman, Board of Control, will be received up till Tuesday, August 12. Plans and specifications can be obtained from the City Architect, City Hall, Toronto.

The Department of Public Highways will receive tenders up till August 19, for the following: Construction of concrete structures on the Provincial Highway from Cobourg to Port Hope. The construction of substructure of Pickering bridge, including abutments, roadway and sidewalk floors. Plans and specifications ca nbe obtained from the office of the resident engineer, Port Hope, of the office of the Department, Toronto.

The Department of Public Works will receive tenders till August 5, 1919, for the construction of an extension to the eastern wharf at Grosse Isle quarantine station, county of Montmagny, Que. Blue prints can be obtained from the Department of Public Works, Ottawa.

Tenders for the construction of the Walkerville sewerage pumping station will be received by the Essex Border Utilities Commission up till August 12. Plans and specificatons can be obtained at the offce of the commission, 14 Victoria block, Windsor, Ont.

Canadian National Railways will receive tenders till August 9, for the erection of a station building at Chicoutimi. Plans and specifications can be seen at the office of the divisional engineer Montreal, Que., or the district engineer, Champlain Market, Quebec.

MARINE

Kingston.—The steamer Phelan went aground at Fraser's Shoal, below Cardinal, and the Donelly Wrecking Co. were requested to send a tug to her assistance.

Victoria.—The third ship of the Foundation Company's building, known as Hull 209, has undergone her steam and endurance trials successfully. The contract speed for these ships is 11 knots. Hull 216, which completed her trials recently, has been handed over to the French crew which were sent out for her.

Montreal.—Canada now has seven ships in commission, and thirteen more will be ready this year. Those already in commission are engaged in the North Atlantic and West Indies trades. These ships up to the present have been employed at profitable rates, and there is no fear that for some time to come they will have difficulty in obtaining remunerative charters.

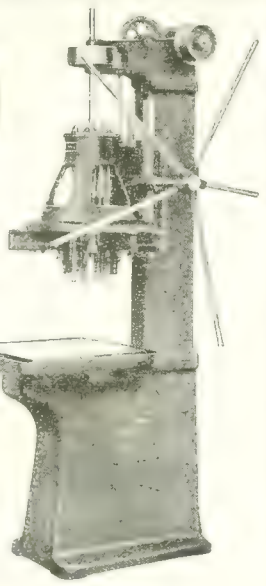
Collingwood.—After four years' war work the Government steamer "Bayfield" has returned to Owen Sound. She has been employed during the war in Halifax on patrol work. The steamer is in charge of Capt. Nat Barret, of Owen Sound, while Mr. John Nesbitt, of the same town, is chief engineer. After overhauling and repainting she will go on survey work on the Great Lakes.

Port Arthur.—The "Canadian Trader," the first of the new Government freighters built at the Port Arthur Shipbuilding Company, sailed for Montreal in command of Capt. J. H. Foote. She will load in Montreal for Cuba, which she will take to Liverpool. After this voyage she will be placed on the Jamaica to Liverpool sugar trade. Mr. Thompson will sail as a guarantee chief for six months.

London.—There will be no attempt on the part of British shipowners to rival the proposed 1,000 feet liners of the American Shipping Board. The tendency is to build vessel of moderate size and speed, and more of them, in an endeavor

No. 12

NATCO



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We also design and build jigs and fixtures for use in connection with NATCOMulti-Drillers.

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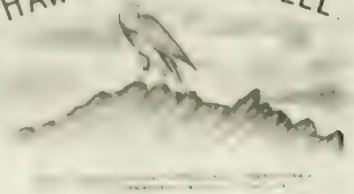

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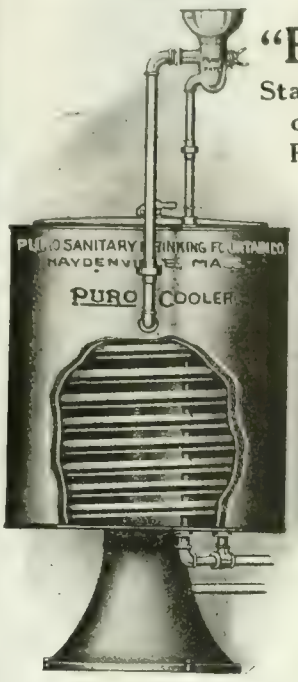

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to catch up with the shortage. To build another "Aquitania" would cost more than double the amount that vessel cost.

Cleveland.—Freighters are now experiencing less difficulty in getting cargo for the down trip. Very few are coming down light, although there is plenty of tonnage offering. The coal trade shows no change from the conditions prevailing over the last three weeks, and there is more tonnage offering than actually required. Some mines are not working on account of a shortage of cars.

Bridgeburg.—The second vessel built for the Imperial Munitions Board at the Canadian Allis-Chalmers shipyard at Bridgeburg, was successfully launched in the presence of a large and distinguished company. Mrs. Wallace Nichols acted as sponsor. The vessel was named "War Vixen." Her sister ship, "War Magic," was launched a short time ago. They are built to the classification of 100A1 at Lloyds.

Toronto.—The Bishop Navigation Co. is making a bond issue of $1,000,000, the money being required for the steamer "Iver Heath," which is to be engaged in ocean shipping. The ship is valued at $2,109,000, and the promoters estimate that the net earnings for the next six months will be $360,000. The vessel is now at Halifax, where she is being rebuilt to the highest classification of Lloyd's register. She was built in 1901. A. E. Ames are handling the bond issue.

Port Dalhousie.—The port received a visit recently from the Canadian Government steamer "Concretia," the only reinforced concrete vessel built in Canada. She is employed by the Government in supplying the lighthouses with oil for their lamps. She is of 320 feet in length, 22 feet beam, and depth 12 feet. Her speed is about 9 miles per hour. An interesting feature is the lighting arrangement, gas being the medium employed. This is stored in a tank in the

Toronto.—The "War Algoma" was launched from the yard of the Polson Iron Works with appropriate ceremony, the christening being performed by Mrs. Dingman, wife of Major Dingman, of this city. The "War Algoma" was the 149th vessel to be launched from the yard, and the 150th is on the stocks and will be launched shortly. The "War Algoma" is a full canal-sized vessel, being 261 feet overall by 43 feet 6 inches by depth moulded 23 feet. She is equipped with triple-expansion engines and Scotch boilers, the working pressure being 180 lbs. per square inch.

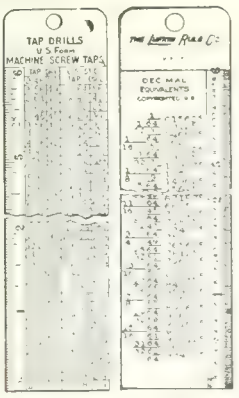
Vancouver.—The Pacific Steamship Co.'s wooden steamer, "Admiral Knight" was burned to the water's edge, and left a charred derelict off the mouth of the Fraser River. Her crew were rescued by the Princess Victoria, bound from Victoria to Vancouver, and landed at Vancouver. The crew consisted of 23 men, and all were gotten off safely. The cause of the fire is unknown, but the blaze started in the engine room. The wooden construction and the oil fuel

made fighting the flames an impossibility. The crew lost all of their belongings, and the pilot even had his license burned.

Victoria.—Victoria is looking forward with great pleasure to the renewed activities of the dockyard at Esquimalt, with the advent of the North Pacific squadron. There is no doubt that now the menace is past the fleet will be spread over the surface of the globe, and the naval stations that were reduced to skeleton propositions during the war will once again be put on a full working basis. Bermuda and Halifax on the North Atlantic and Esquimalt on the North Pacific are probably the best examples of this. The United States navy will also maintain a fleet on both oceans, and the result will be a large measure of prosperity and fuller social life for the cities within their purlieu.

Port Stanley.—The inauguration of the steamer service between Cleveland and Port Stanley was attended with several undesired features. The "Theodore Roosevelt," a 22-knot steamer, arrived from Cleveland with 1,500 passengers, and reached the Government wharf in safety. It was when she tried to get away again that the trouble started. She tried to turn at the dock, but her stern grounded on the undredged channel and she had to give up the attempt. In trying to get out stern first the vessel was blown by the stiff breeze up against the old pier. Trying to clear this her forward end stuck in the mud. Finally she was towed out into clear water by a tug, not before breaking a few piles from the old pier by trying to make fast a rope to them. The American passengers asked earnestly from the Canadians on the quayside if this was really the finest harbor on the Canadian side, as advertised.

London.—The Board of Trade announce the awarding of the silver medal for gallantry in saving life at sea to the following: Capt. E. C. Perry, Temporary Skipper Martin Dalton, and Seamen Harold Clouter, Charles W. Penney, Adolphus Morey, Daniel Ralph and Michael Whelan, and the bronze medal to Chief Engineer Robert Pierson and Seamen Mathew Shanahan, Patrick Gallagher, George Westcott and Joseph Budden. The occasion when the services were rendered by these men was when the steamer Florizel of Liverpool stranded on the Newfoundland coast about 15 miles N.E. of Cape Race. A heavy sea was running, and in response to wireless calls for assistance, several vessels arrived from St. Johns but were unable to approach the wreck till the following day. They started at daylight and had all the survivors taken off the wreck by 8 a.m. The rescue had to be effected by means of dories, and it was in performing these rescues that the men mentioned above displayed great bravery and saved many lives.



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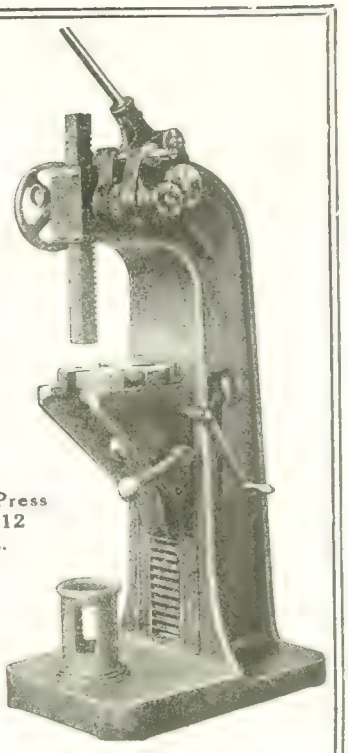

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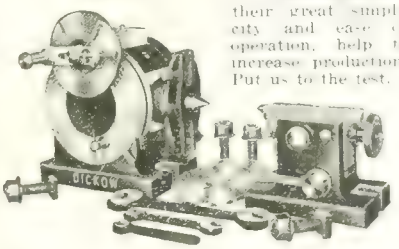

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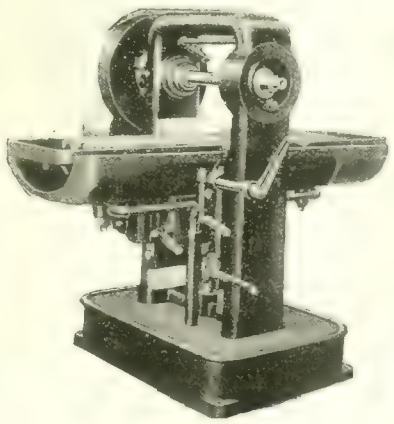

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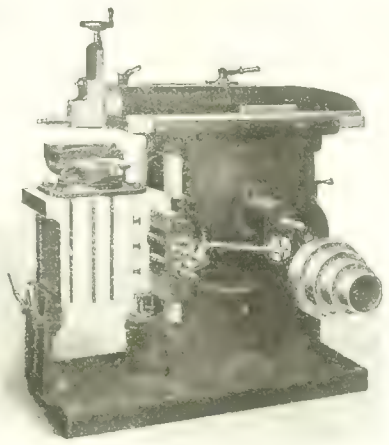

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One used 18 x 8 Cincinnati quick change gear, three step cone, back geared engine lathe.

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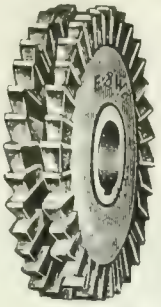

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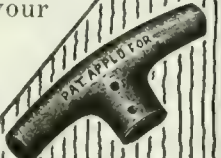

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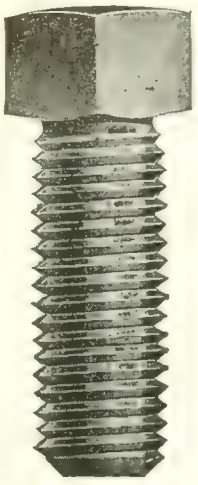

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BUY W-S WAR-SAVINGS STAMPS

DO not think patriotic work is a thing of the past. The great need to-day is to repatriate the returned soldier, and to promote Prosperity so as to solve the problem of the War Burden. The Dominion of Canada requires your help.

You can be a vital factor in the Government's plan to sell War-Savings Stamps by getting your customers to buy Thrift Stamps.

If they buy the Thrift Stamps from you, they will soon be War-Savers, helping themselves and the country in the great work of Reconstruction.

Put up your Thrift signs, get your stock of stamps, and push the sale among your customers.

Every Bank and Money-Order Post Office carries Thrift Stamps.

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The City of Sarnia

The Gateway to the Upper Lakes

Mr. Manufacturer, study the location of Sarnia on the map and ask yourself this question:

COULD SARNIA BE BETTER LOCATED?

With our frontyard an immense waterway, in fact, the world's most industrious waterway, and with transportation by rail so accessible, there is nothing in location whereby Sarnia could be bettered.

In the past, Sarnia has been built substantially with none of the semblance of a boom. In the future, Sarnia will be built as substantially with the boom which is only possible by its citizens' investment of faith in its bright future. These are days of reconstruction; we stand at the portals of a new day and see just ahead of us important strides in progress.

A summary of the advantages Sarnia offers to manufacturers seeking sites for new plants:

Sarnia is located at the gateway of the West. It is the terminus of the Grand Trunk Railway, with the world-famous St. Clair Tunnel, and the headquarters of the Northern Navigation Co. and P.M. Rly. Best shipping facilities and abundance of electric power at reasonable rates.

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Living conditions are ideal; no strikes or labor disturbances of any kind.

It has a delightful residential section; miles of paved streets, beautifully shaded; fine homes; clean streets; summer homes on Lake Huron; free bathing beaches. Two boats daily to Detroit. Main line double track Chicago to Montreal.

Investigate Sarnia Now. For full particulars re manufacturing sites, write

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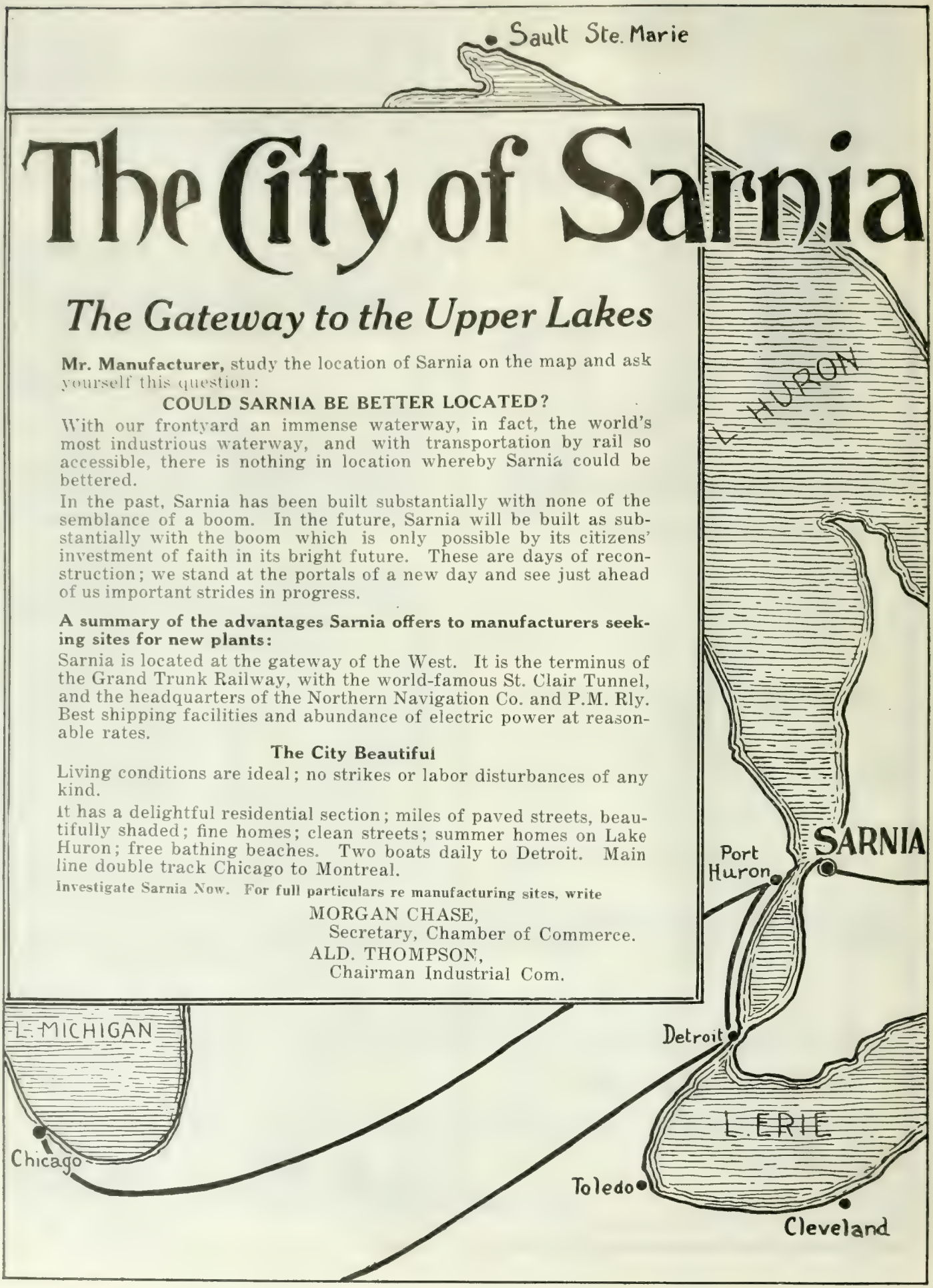

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10 welds, 5 years old, still running. Bevel gear 85" diameter after being repaired in ten places by our process.

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Consult us on your machine problems

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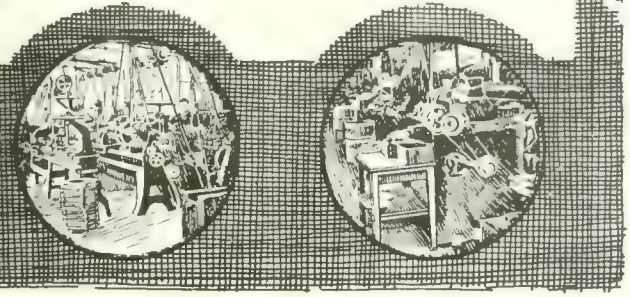

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Hamilton Ontario

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Open Hearth, Basic and Acid, Electric and Alloy Steels

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For Ships, Railways, Rolling Mills, Gears, Machinery and Ingots to 35 tons

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Plates and Heavy Sheets to 30 inches wide, Soft and High Carbon
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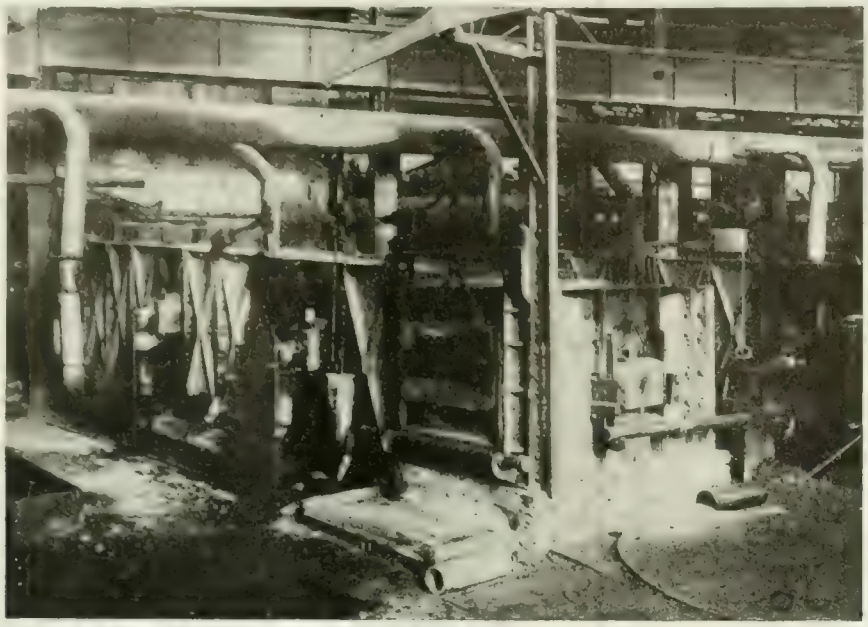
Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



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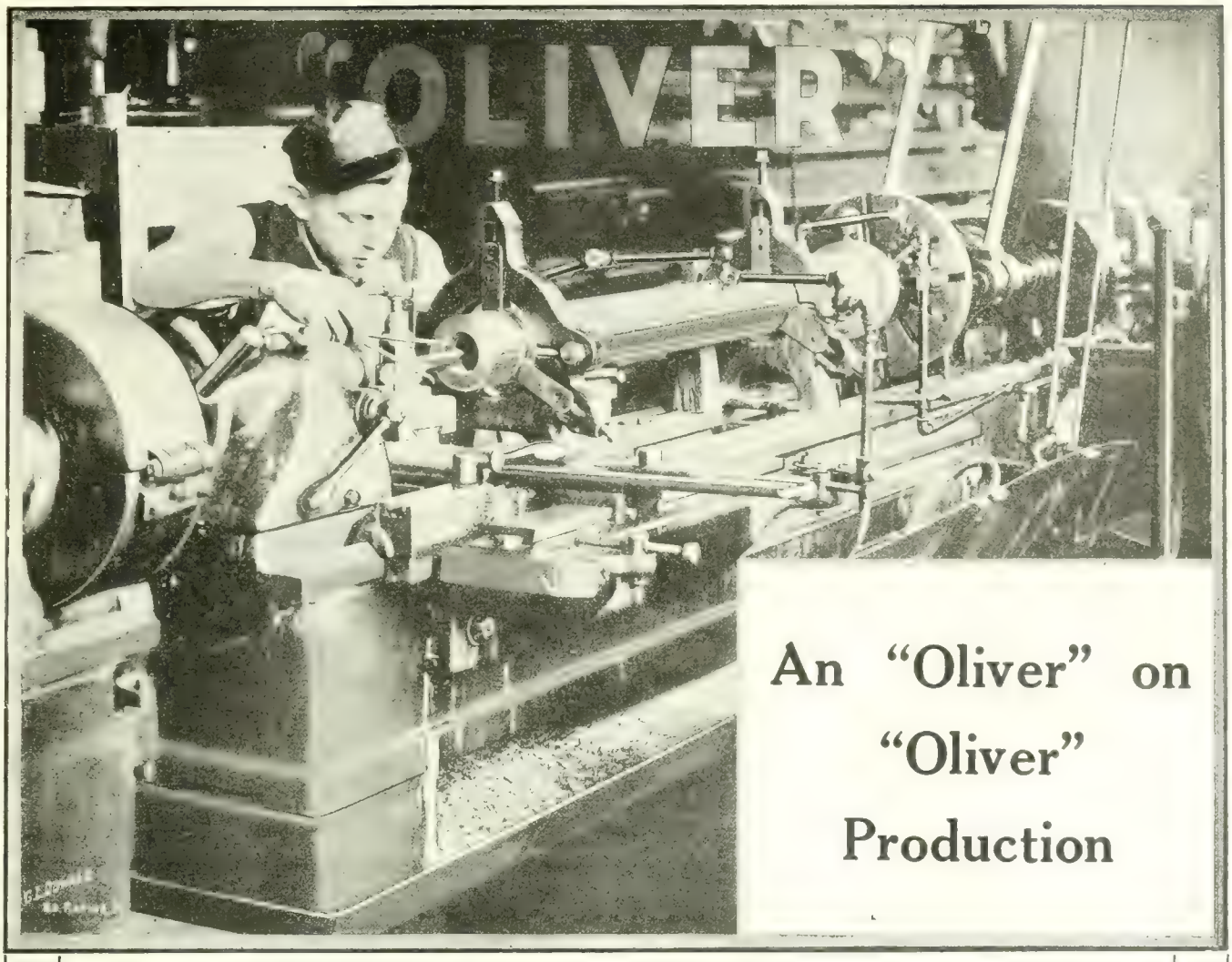

An "Oliver" on "Oliver" Production

Illustration shows an "Oliver" 16" Engine Lathe turning a spindle for an "Oliver" 28" Lathe.

Install an
"OLIVER"

The accuracy, convenience and rigidity of "Oliver" Lathes, the cost and quantity of their output make them a logical choice for modern tool room or production work.

May we send our Bulletins giving full particulars on the "Oliver" Engine Lathe, "Oliver" Turret Lathes, Speed Lathes, Die Filing Machine.

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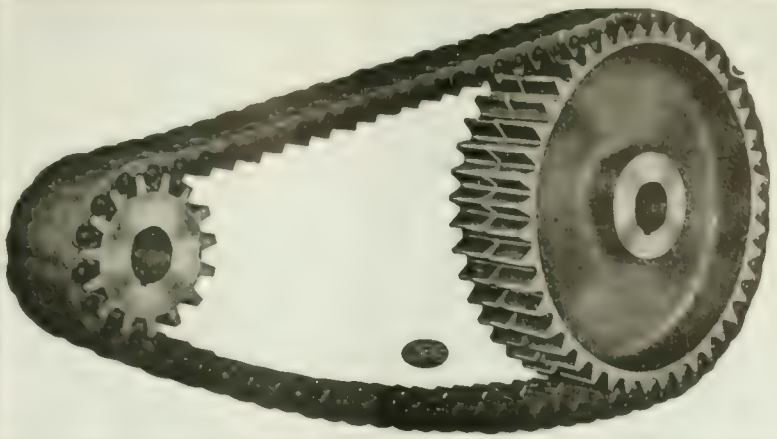

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Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅝" diam.

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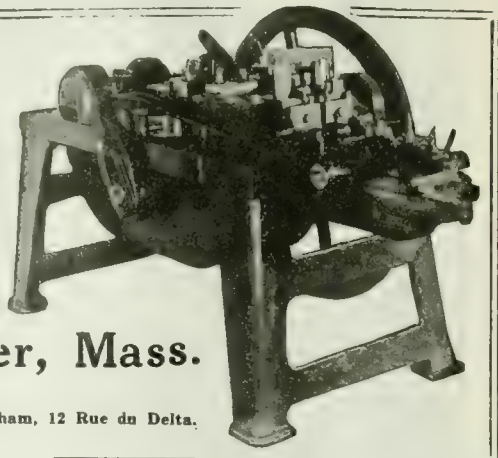

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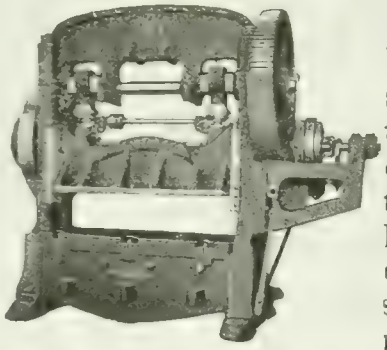

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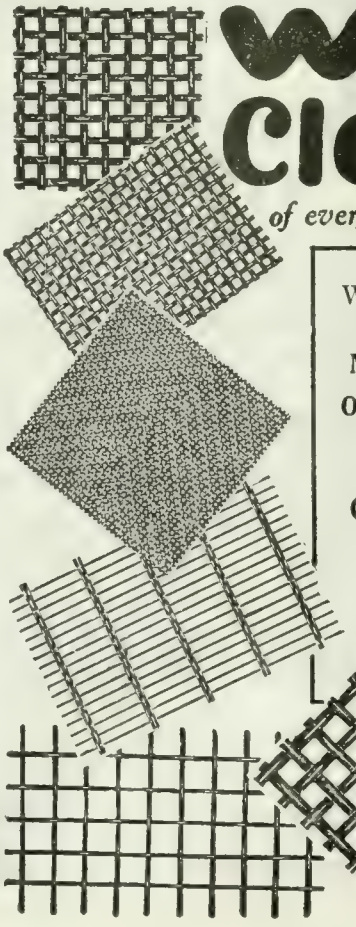
of every description



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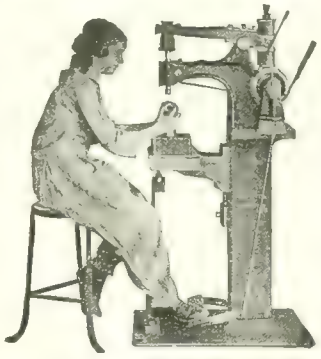

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Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the **High Speed Riveting Hammer** does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
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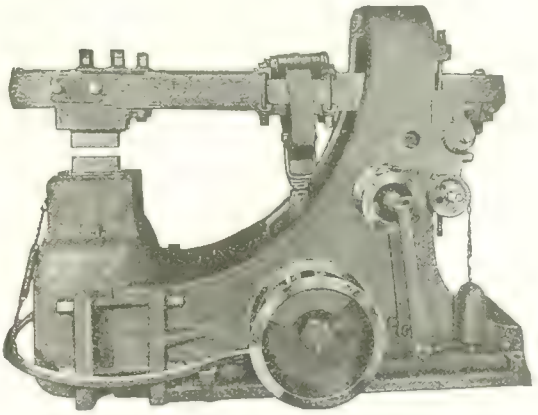
We'll Help You to Blaze a Trail of Efficiency



The Rochester Helve Hammer

The Mechanic who works comfortably does the best work in quick time. He gives you WORTH-WHILE results. You can't pry him loose from a superior tool. He brags about it. Give the chap a chance who uses the Helve Hammer. In 9 cases out of 10 he'll say, "The Rochester Helve" for mine. He is the man who knows the 100% Satisfaction Helve. We can't tell you all its distinctive features in this brief advertisement, so we ask you to write for our Helve Hammer Book.

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"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

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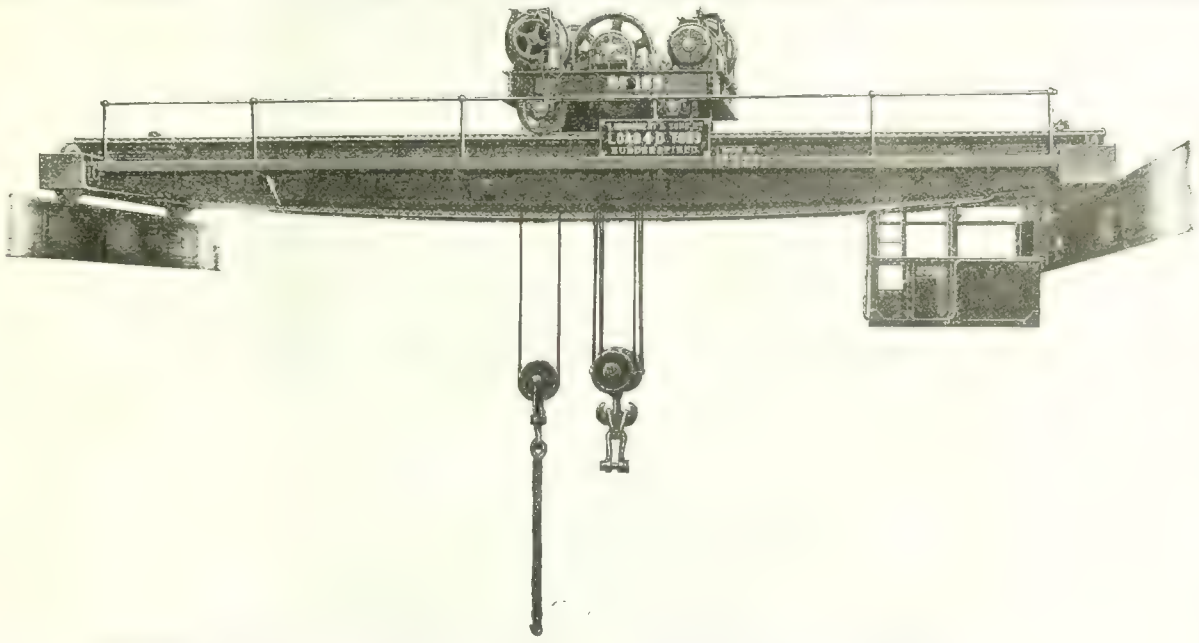

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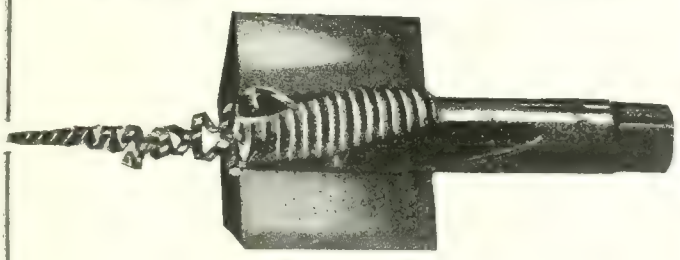

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The Most MODERN,
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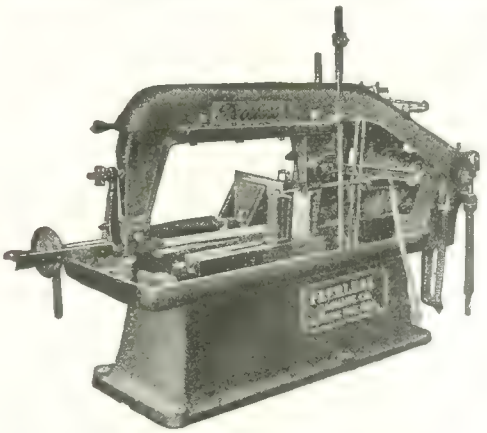

DON'T turn down the "Peerless" because you have tried out other hack saws which did not answer your requirements.

Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are to-day among the largest and best-satisfied users of our High-Speed Saws.

The "Peerless" is different—and better. It does 50 to 100 per cent. more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space. What is your work? We can tell whether the "Peerless" will do it, and back our judgment with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

PEERLESS MACHINE CO.

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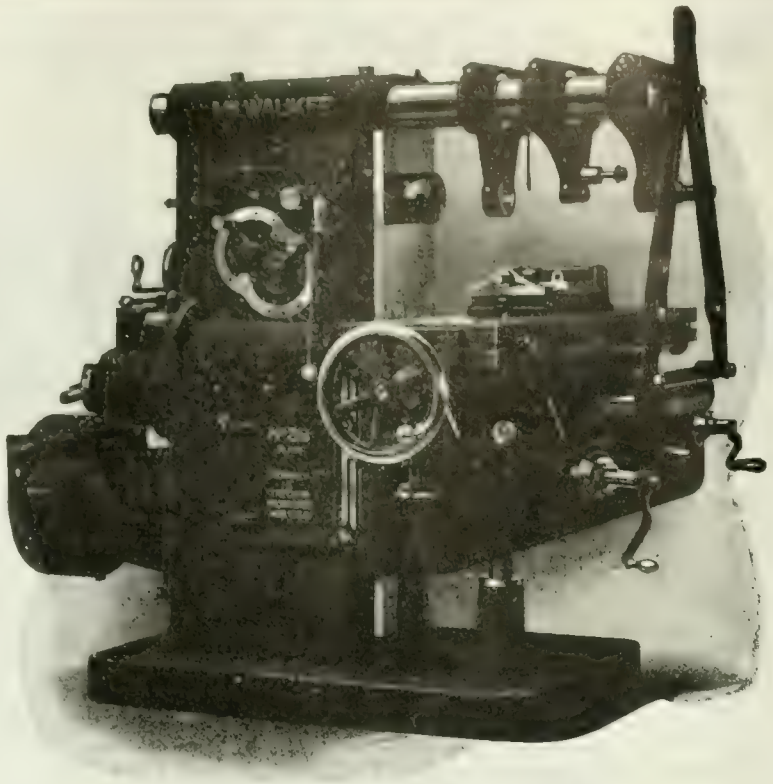

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Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

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Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

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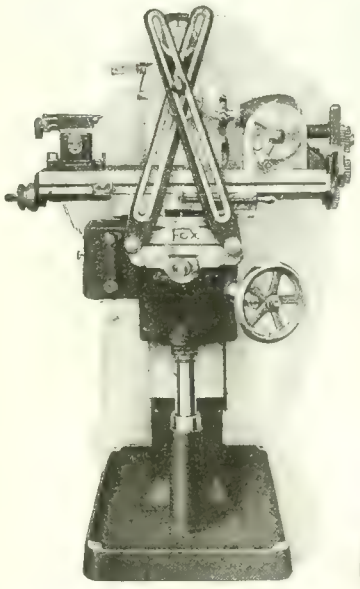
REGISTERED

MILLING MACHINES

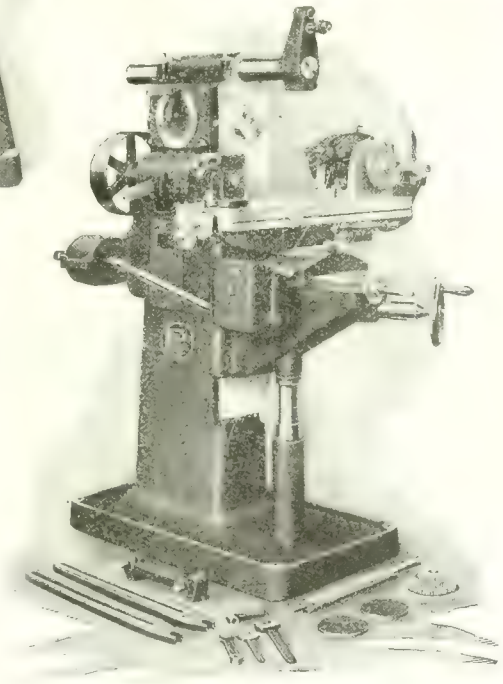
FOR

Rapid Production of Motor Parts



The **demand** for increased production **requires tools** of **great strength** and **durability**; the Fox 2-A Universal Milling Machine illustrated has met this demand, and is being used wherever extreme accuracy and quantity production are required.

The machine has a universal table, spiral cutting attachment, 10″ Dividing Head with 6″ Universal Chuck, making it a machine **especially adapted for Tool Room Work.**



The **United States Government** used this machine in its various **repair shops** for **Aeroplane Motors.**

You should be using this tool to help the production of parts necessary for reconstruction.

Specifications—No. 2 A Miller.

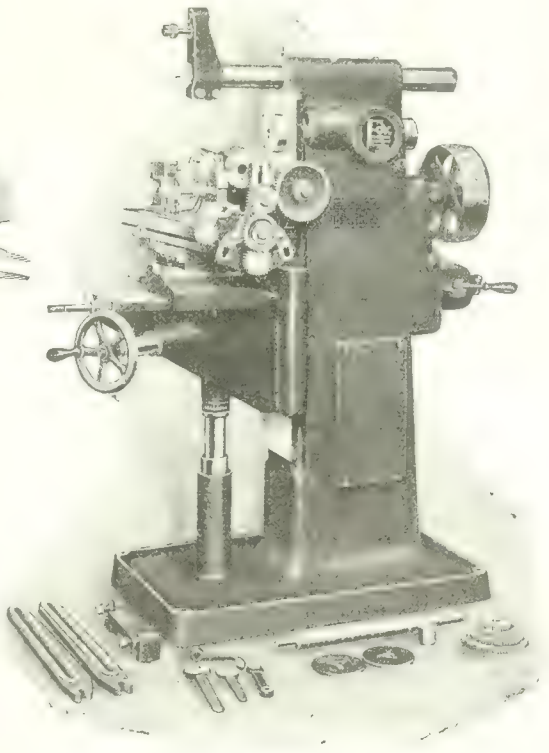
Spindle speeds ....12 From 21 to 423 r.p.m.

Table feeds .....6 From .317″ to 2.79″ per min.

Table .....8½ x 27″ Long. feed (power) 26″. Vertical feed (hand) 13″. Trans. feed (hand) 8½″.

Drive...Single pulley 10 x 3″ running 250 r.p.m.

Gears — Hardened steel.
Weight .....1,500 lbs.



We build this same machine with a plain table, omitting the spiral cutting attachment and Dividing Head.

Our No. 1 type machine has a four-step cone drive, and while being a lighter machine is a "bear" for work. This was proven by **the hundreds** of **them in the largest munitions plants.**

We also build the Fox Multiple Spindle Drilling Machines.

FOX MACHINE COMPANY

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The probability is two to one that it's a

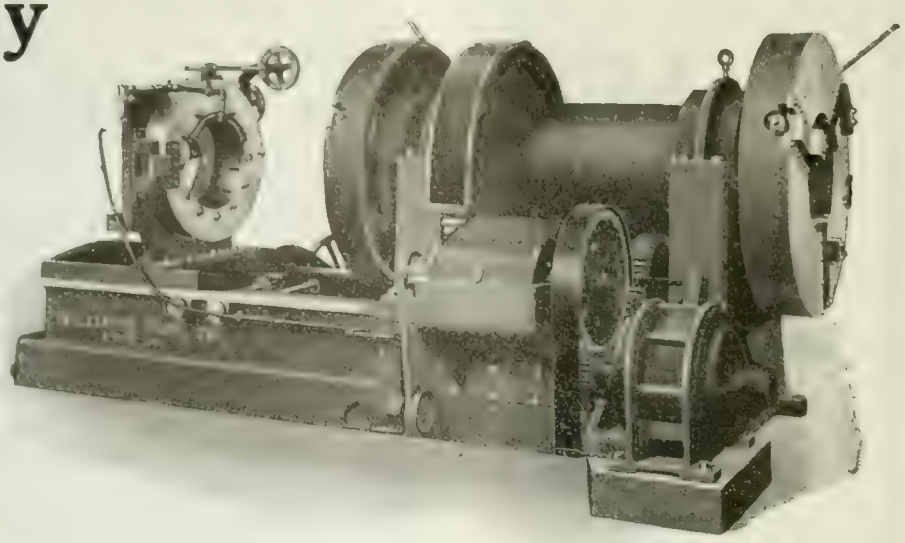
Williams Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.



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Springs *for* Every Use

We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

Tell us the purpose for which the spring is intended, and our experts will gladly co-operate to see that you get the design best suited to the purpose.

Dunbar Springs are thoroughly tested for **accuracy** and **quality**. Send us specifications, for estimates.

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Did It!

Castings by the hundreds—yes, by thousands—all easily, rapidly and efficiently transferable with the Transveyor.

Not on the floor, but on wooden platforms, or on skids made instantly mobile by elevating the Transveyor under the loaded skid—that is Transveyor transfer.

Despatching and storing material the Transveyor Way, promotes system, saves time and labor through the elimination of rehandling; reduces "overhead" cost.

Any business with a floor under it can beneficially apply Transveyors. Our latest machinery bulletin is yours for the asking. To what address shall we send it?

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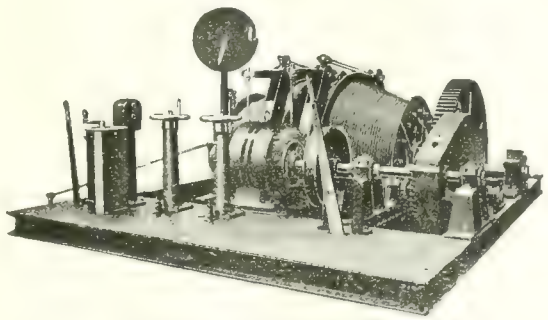

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Has extra fasteners on sleeves and trouser legs permitting their being tightly fastened around wrist and ankles. **No gaping garments to catch in machinery.**

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An exceptional garment at a reasonable price.

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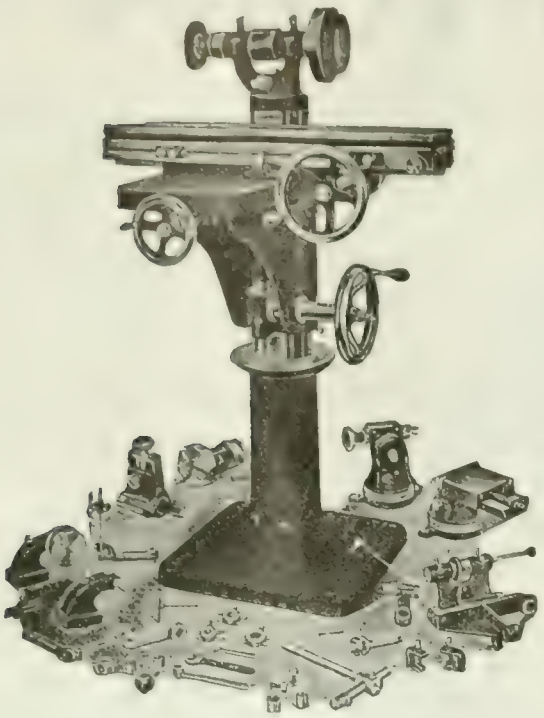
Makers of Adjustoglas Goggles

2044 E. 9th St. Cleveland, O.



The Greenfield Universal Grinder

For General Tool Room Work

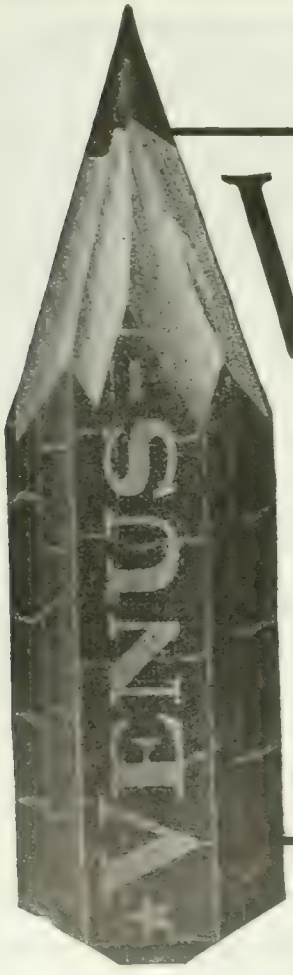
This grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company,
GREENFIELD, MASS., U.S.A.



VENUS

Engineers use VENUS Pencils in their offices and drafting rooms because of the *exact* uniformity of each of their 17 degrees reduces errors to a minimum. Quicker, easier, better work is done with them, by executives and working staff alike.

Special 14c Offer

Send 14 cents for 3 trial samples, mentioning degrees. After you find how perfect VENUS Pencils are, buy them at any dealer.

American Lead Pencil Co.
238 Fifth Avenue New York
and Clapton, London, Eng.

PENCILS

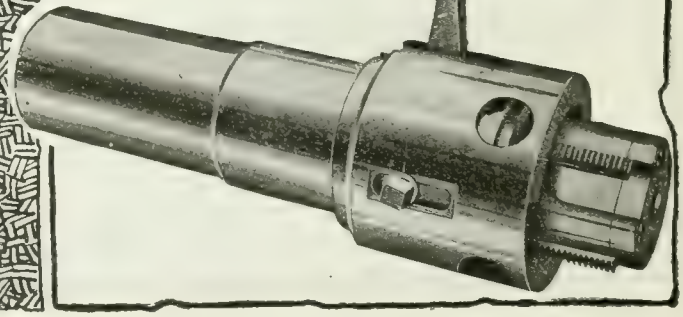
We wanted something original— this is what we got

"BOTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

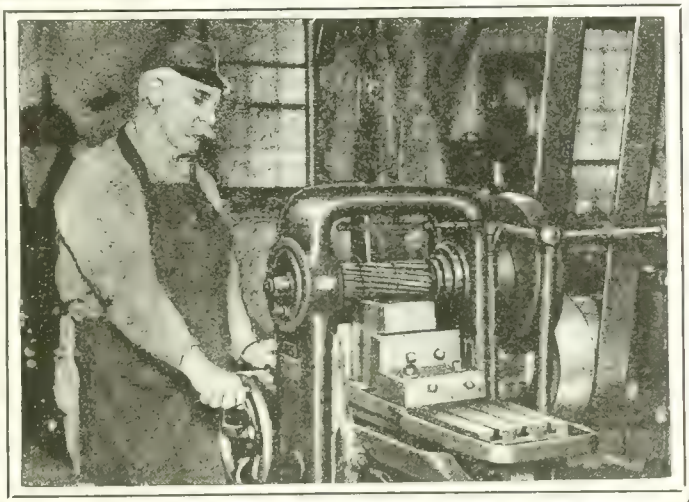
Victor Tool Company
Waynesboro, Pa.
U.S.A.

Send For Estimates



BRIGGS MILLER

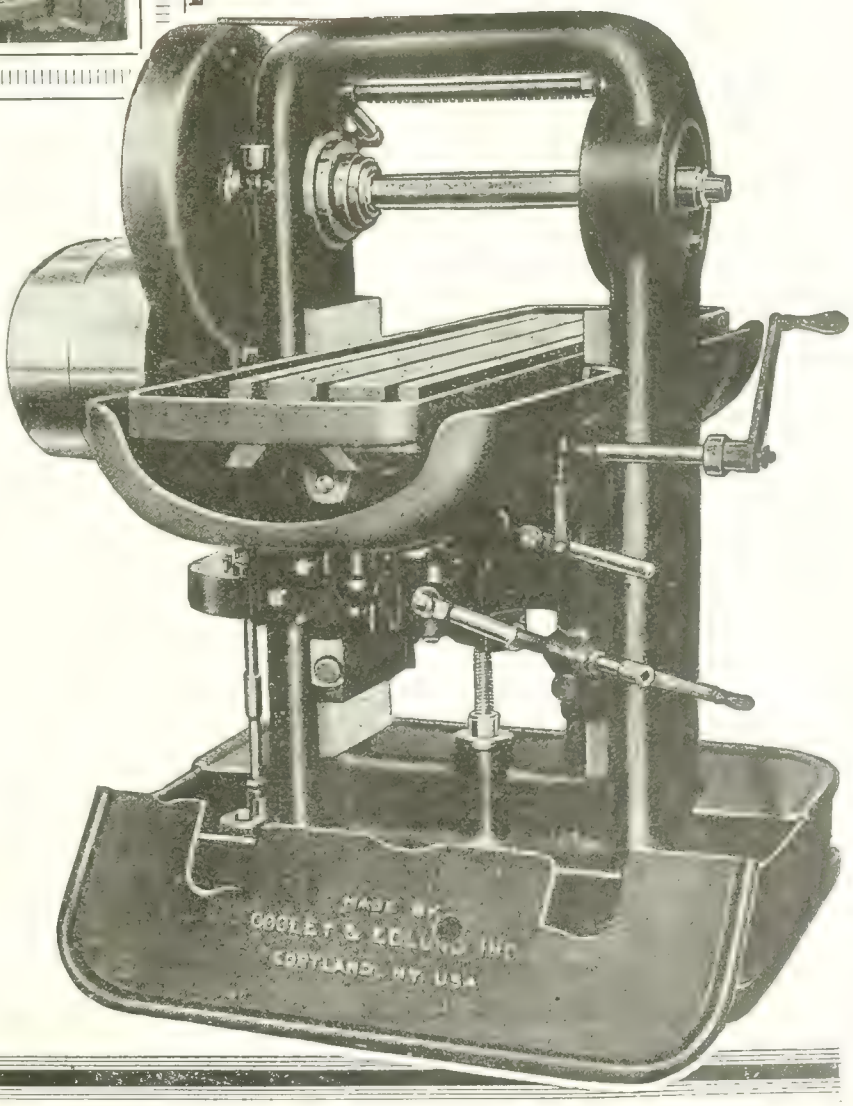
Keeps Five Die Sinkers Going



HERE you see the Briggs Miller Squaring Die Blocks, and it is working so fast it keeps five die sinkers going.

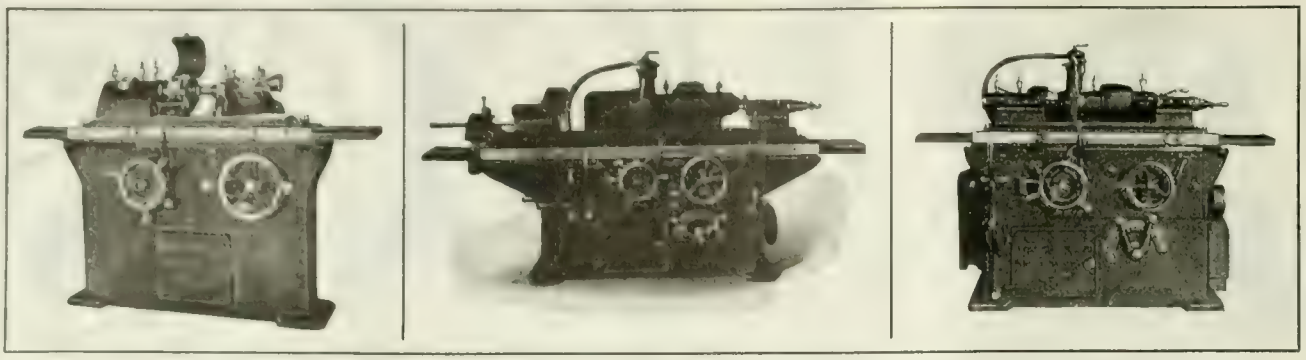
Some are new, squared from the rough; some are old, annealed, cut down and made over; some are oblong, some square, in sizes up to 9 inches. This Briggs Miller has been squaring blocks for four years; has never given any trouble. When cutters get dull the operator has another gang ready to go on with the work. Unusual rigidity accounts for Briggs' higher efficiency.

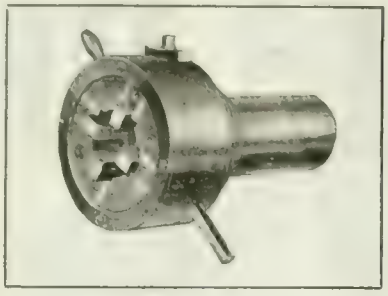
Don't you think you could use this tool to advantage in your shop? Write for the details.



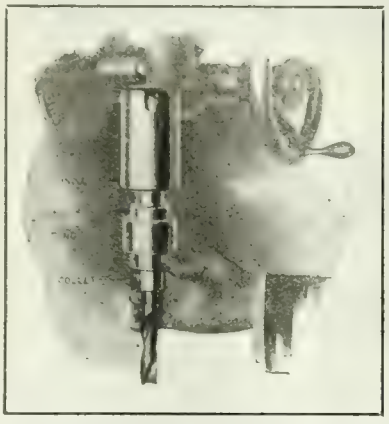
Gooley & Edlund, Inc.
Cortland, N.Y., U.S.A.

Garlock Walker Machinery Co., Ltd.
Toronto, Ont.
Williams & Wilson, Ltd., Montreal





MODERN TOOLS
MAKE BUSINESS HUM



The Modern Line supplies indispensable aid in business progress. Modern Tools are precision tools of the finest quality, noted for accuracy, dependability, volume of output and durability. We make:

—**Modern Plain Grinders**
10 sizes—8″ x 18″ to 16″ x 60″.

—**Modern Internal Grinders**
One model with fixtures in 3 sizes.

—**Modern Universal Grinders**
Normal range 13″ to 40″.

—**Modern Chaser Grinders**
For any chasers with parallel sides and general tool room work.

—**Modern Self-Opening Die Heads**
18 sizes—for threads up to 7 inches.

—**Modern "Magic" Chucks**
For quick change of tools on live spindle machine.

—**Modern Collapsible Taps**
3 sizes—Will tap holes ¾″ to 3″.

—**Modern Tapping Attachments**
For driving tools "through" or "to bottom."

All are tools of widespread use in the States—all have enviable records for reducing costs and speeding up production.

Send for technical bulletin of any which may interest you.

Send us your specifications and blue prints for data on your particular kind of work.

MODERN TOOL CO.

Main Office and Works: **ERIE, PA.** STATE AND PEACH STS.

Canadian Agents: Rudel-Belnap Machinery Co., Limited, Toronto and Montreal

Branch Offices:

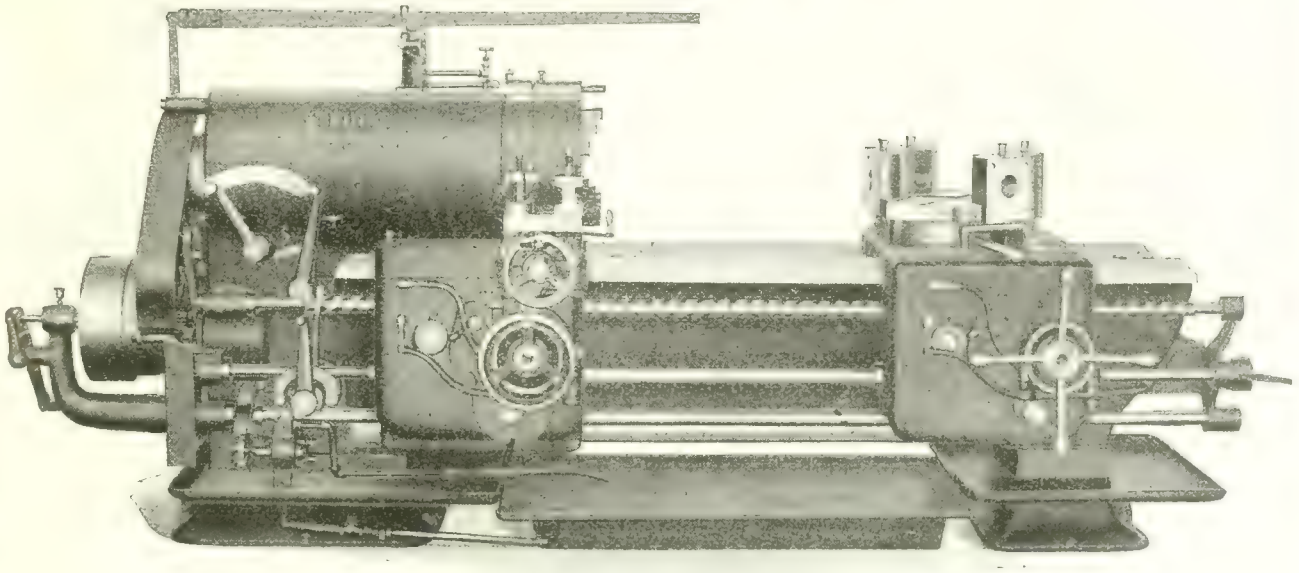
New York, N.Y., 2 Rector St.
Chicago, Ill., 32 N. Clinton St.
Cleveland, Ohio, Guardian Bldg.
Detroit, Mich., 1223 Dime Bank Bldg.
Cincinnati Ohio, 2 Greenwood Office Exch.
Export Department, 2 Rector St., N.Y.C.

INDUSTRIAL REVIVAL
DEPENDS ON
YOU

Start your own ball a-rolling.

Remember the order you give goes to the man who buys from the chap who orders from you.

STEINLE



Another reason why the Steinle 24″ Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work.

The One Piece Box Construction Design of Bed and Headstock Housing

The headstock is entirely enclosed on front, top and bottom sides, and also on the back with the exception of an opening left for assembling purposes and for which a suitable cover is provided. This design furnishes substantial support for the main spindle bearings and also for all driving shafts.

The bed is enclosed on all four sides and designed to withstand torsional strains and to properly support the side carriage and turret in alignment with spindle when carrying heavy tool loads.

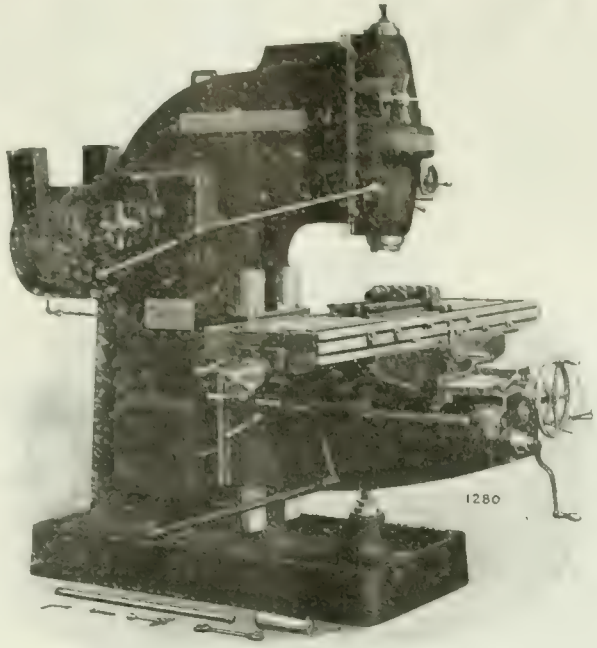
This bed and headstock housing by reason of the amount and proper distribution of metal absorbs all vibration due to heavy cuts, and shock or jar incidental to heavy intermittent or uneven cuts.

There are more good reasons why the Steinle 24-inch Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work. We will give these reasons in future advertisements in this journal. Watch for them. They will be interesting to you.

STEINLE TURRET MACHINE CO.

MADISON - - WISCONSIN, U.S.A.

The New Cincinnati No. 4 High Power Vertical



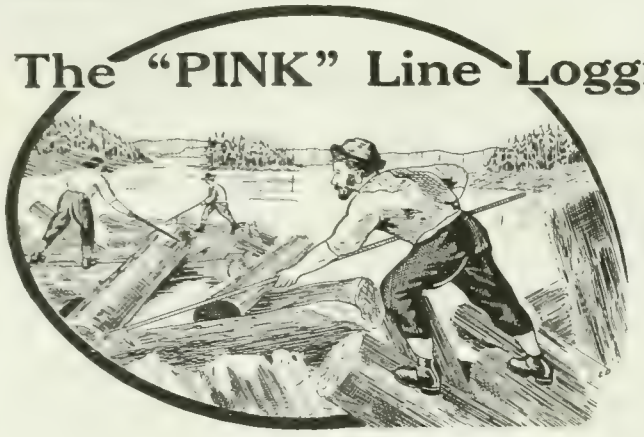
- Intermittent feed, power quick traverse
- Square gibbing with narrow guides
- Feed changes at front of knee
- Safety couplings in feed transmissions
- Individual feed control levers
- Automatic lubrication
- Centralized oiling
- Stream lubrication
- Hardened sliding gears throughout
- Starting lever at front
- Automatic brake
- Cincinnati standard flanged spindle end
- Spindle can run in either direction

Patent Rights Fully Reserved

THE CINCINNATI MILLING MACHINE COMPANY

CINCINNATI, OHIO

The "PINK" Line Logging Tools and Handles



MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

EXPORTERS TO EUROPE

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited

PEMBROKE, ONT., CANADA

Advertise It!

If you have Machinery which your plant has outgrown—advertise it. Or if you have a Factory Building which you have outgrown—advertise it. That is, advertise it in our Classified Advertising Section and SELL what you have for sale.

CANADIAN MACHINERY

CLASSIFIED ADVERTISING SECTION

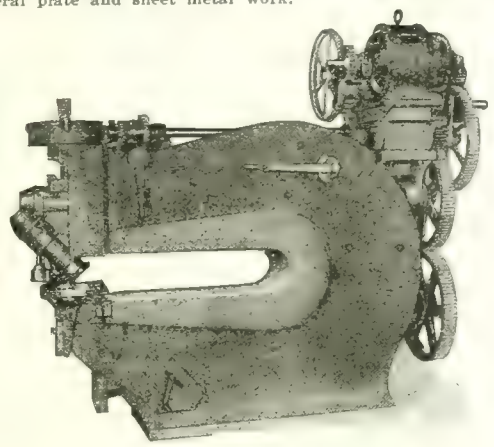
143-153 UNIVERSITY AVENUE - - TORONTO, CANADA

H. COLLIER SMITH
"QUICKWORK"
Registered U.S. Patent Office

ROTARY SHEARS

Made in 6 Sizes

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



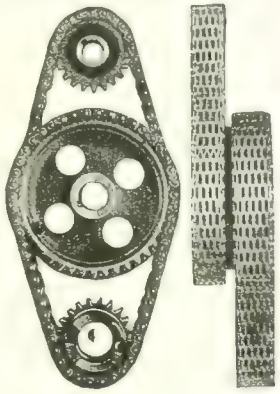
Patented June 3rd, 1913

SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing

Write for Catalogue

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.



War Record Not Made Public

The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916-7 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.,
Hartford, Connecticut

Your Money's Worth

Never again will the Canadian Nation and People be the same careless improvident spenders of "ante bellum" days. "EFFICIENCY" and "GET YOUR MONEY'S WORTH" will be the popular motto and the successful machine shop manager must be able to see the advantage of making one pound of High Speed Tool Steel do the same work as ten pounds in forged tools; in other words he must and will

USE ARMSTRONG TOOL HOLDERS

No heavy "stub-ends" to throw away. No time lost with men at the grinder while lathes stand idle. No stock of heavy sizes of steel to carry, and the blacksmith as a tool-dresser is eliminated entirely.

Armstrong Tools are great favorites with the men—a good thing to consider from a production standpoint.

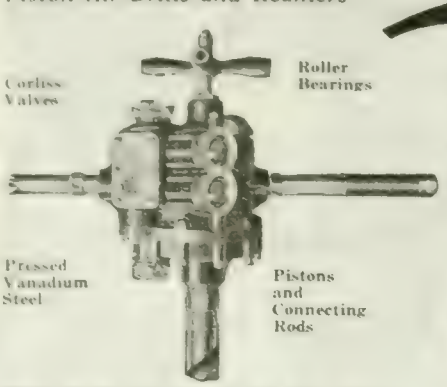
Our Catalogue is of handy pocket size and will be mailed to you upon request

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
STRONG STRONG
106 N. FRANCISCO AVE. CHICAGO U.S.A.

Thor

Pneumatic Tools

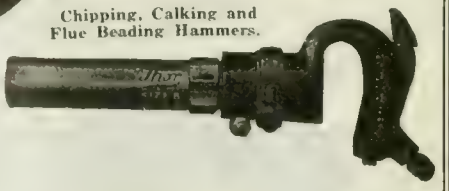
Piston Air Drills and Reamers



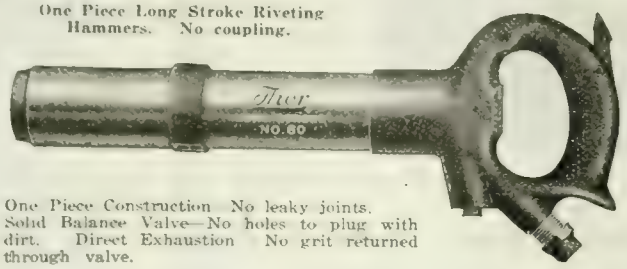
Four cylinder type, two on each side. Semi-Corliss valve close to each pair of cylinders gives greater efficiency and power, saves clearance losses and allows air to enter cylinder at full pressure of the pipe line.

SPEED UP YOUR PRODUCTION AND BE PREPARED FOR THE COMING BOOM

Chipping, Calking and Flue Beading Hammers.



One Piece Long Stroke Riveting Hammers. No coupling.



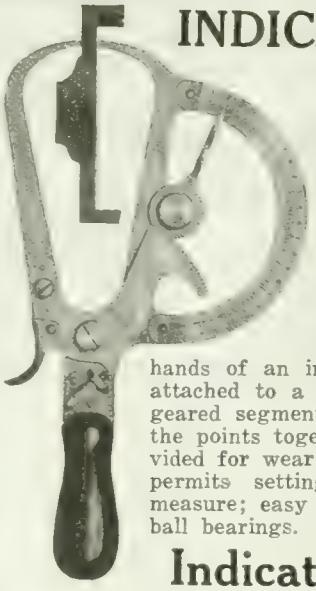
One Piece Construction No leaky joints. Solid Balance Valve—No holes to plug with dirt. Direct Exhaustion No grit returned through valve.

Four sizes, 1″ to 4″ stroke. The barrel and all wearing parts are hardened and ground, making the Thor Chipper practically free from vibration.

Independent Pneumatic Tool Company

General Office: 600 West Jackson Blvd., Chicago

CANADIAN OFFICES: 334 St. James St., MONTREAL; 32 Front St., TORONTO; 123 Bannatyne Ave. E., WINNIPEG; 1142 Homer St., VANCOUVER



INDICATING CALIPERS

This finely made tool, of the simplest construction, incorporating features of outside calipers, rule, magnifier, and indicator, is accurate, easily read and manipulated with one hand. Great saving of time is effected in the hands of an interested user. A hand attached to a pinion is actuated by a geared segment; a coiled spring draws the points together; adjustment is provided for wear of parts; locking device permits setting of tool to required measure; easy movement is effected by ball bearings.

Indicating Calipers

are used by

MACHINISTS, PATTERN, TOOL and MODEL MAKERS.

$8.75 **3″** Graduated in 64th inches, Scale enlarges two times. **2″** Graduated in 100ths inches. Scale enlarges three times.

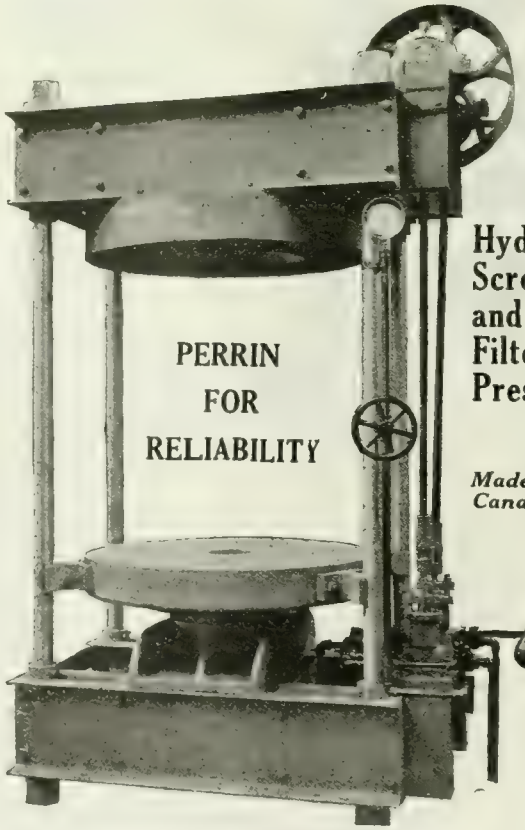
Write for folder or make inquiries thru local dealer.

MADE EXCLUSIVELY BY THE

INDICATING CALIPERS CO.

506 East 19th St., New York

Stocked by Exclusive Canadian Agents:
Williams & Wilson Limited, 84 Inspector Street, Montreal, Que.



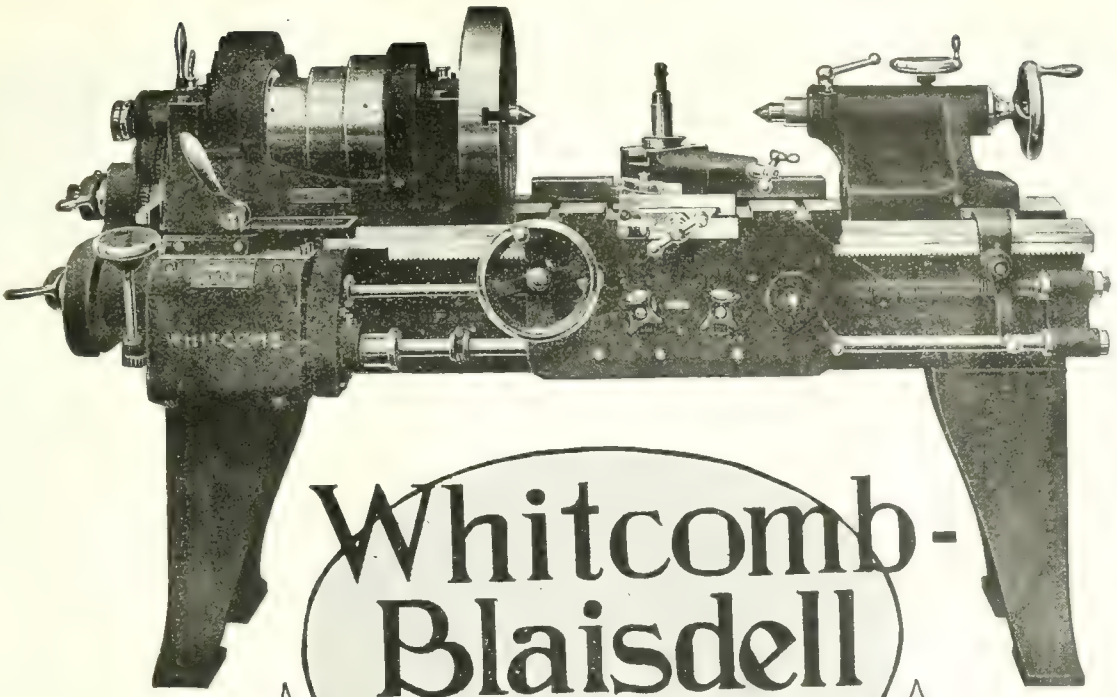
Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED

TORONTO



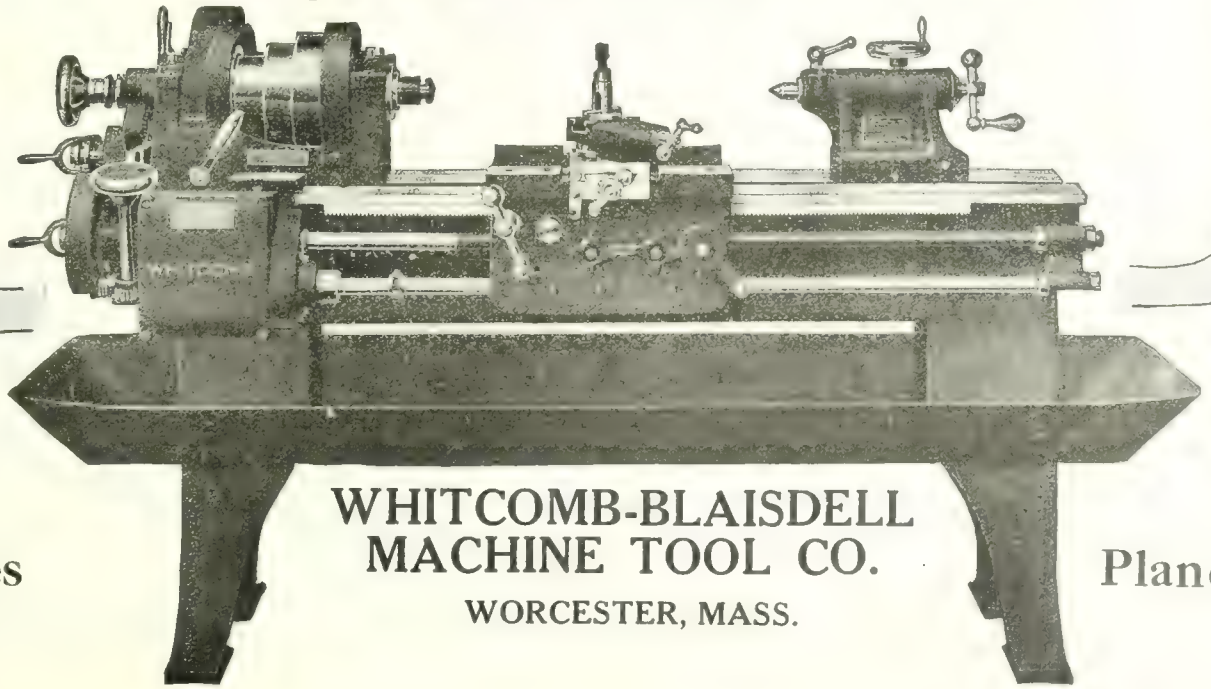
Whitcomb-Blaisdell Lathes

POWERFUL, WELL-BALANCED MACHINES THAT ARE LIGHT-RUNNING AND ADAPTED TO ALL CLASSES OF **RAPID MANUFACTURING.**

Every feature of the W-B Lathe of to-day has been considered from the viewpoint of greatest utility. Materials used embody toughness and durability. Our tests must prove great wearing quality and strength before any material is selected.

The product of an organization that has for sixty years been distinguished for the superior design, workmanship and material of its product.

Write for our latest catalog describing all of the good features of Whitcomb-Blaisdell Lathes.



Lathes **Planers**

WHITCOMB-BLAISDELL MACHINE TOOL CO.

WORCESTER, MASS.

Give a Tribloc severe service

—use it every day
—work it to capacity
—let anybody "run" it
—operate it indoors or out

It never falters, never fails. It's built for service and "delivers."

Gears, chains, hooks and all working parts are made of steel. The **Loop Hand Chain Guide** prevents "gagging" of the hand chain, injury to the block and overriding of the flange when working at high speed.

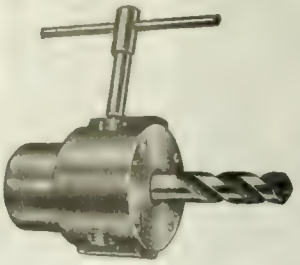
For a safe, durable, dependable hoist—a **Tribloc,** with capacities of ½ to 40 tons. Guaranteed (in writing) for five years.

Ford Chain Block & Mfg. Co.
Second and Diamond Sts., Philadelphia, Pa.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
120 BROADWAY NEW YORK, U.S.A.

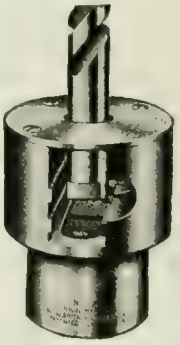
PARIS TURIN ZURICH BARCELONA

2154-D



UNION
POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



UNION
Manufacturing Co.
New Britain, Conn.

New York 26 Cortland St.

Makers of a complete line of chucks

B-T THREAD LEAD INDICATOR

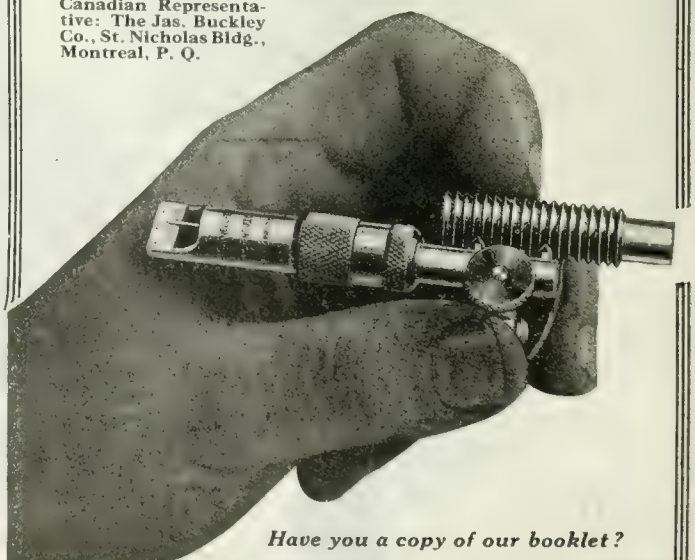
Be Sure You're *Right*—Then Go Ahead

Getting the right thread lead instantly, and maintaining a constant check upon it, minimizes the possibilities of delays in assembling and reduces the number of parts scrapped through incorrect measurements.

B-T Thread Indicators detect errors of one thousandth of an inch from correct lead. They are easily read—absolutely accurate—and can be used for testing odd pitches, as well as external and internal threads.

BICKNELL-THOMAS CO.
GREENFIELD, MASS

Canadian Representative: The Jas. Buckley Co., St. Nicholas Bldg., Montreal, P. Q.



Have you a copy of our booklet?

Boys, use these STOCO CELOGLAS SHATTER-PROOF LENS SAFETY GOGGLES

IT'S one of your most important duties to see that your workers in eye-hazardous positions are supplied with suitable eye-protectors. You cannot give them a better goggle than the Stoco safety goggle with Celoglas "Shatter-proof" lenses. It's a wonderful protection glass — staunch and durable and extremely comfortable in use. Your men will wear it willingly.

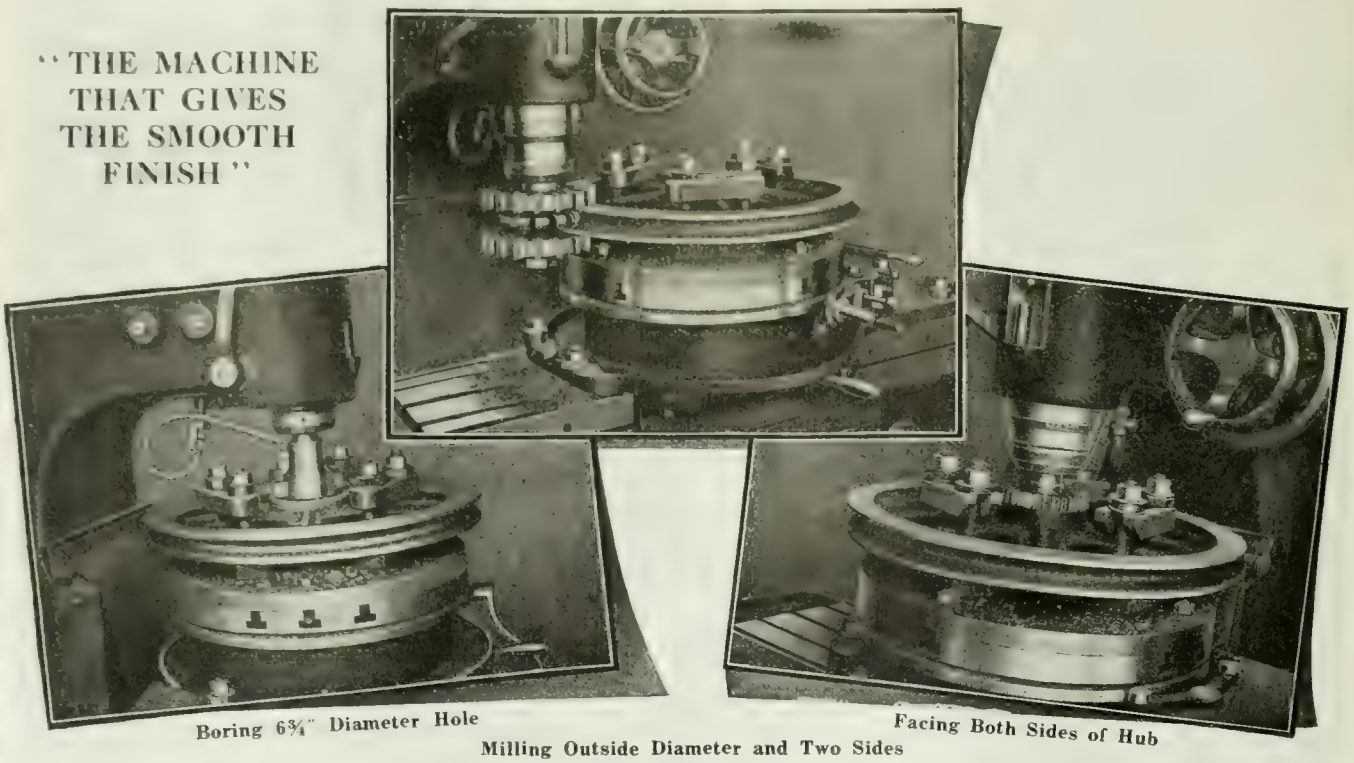
The Stoco safety goggle is made with easy cable earbows or with elastic headbands. The price with Celoglas lenses is $150.00 per hundred pairs; with heavy, clear optical glass lenses, $115.00 per hundred pairs.

STANDARD OPTICAL CO.
GENEVA, N.Y.

DOUBLE PRODUCTION

ON THE SAME JOB BY THE SAME WORKMEN

"THE MACHINE THAT GIVES THE SMOOTH FINISH"



Boring 6¾" Diameter Hole

Facing Both Sides of Hub

Milling Outside Diameter and Two Sides

A SIMPLE PROOF OF MACHINE SUPERIORITY

The photographs shown above were taken in the plant of the Mead-Morrison Company at East Boston, Mass. They show real every-day operations—not just posed for photographic purposes—and operations on which the manufacturers have doubled their production by using Becker Belt Driven Millers.

Prior to the installation of Becker Vertical Millers, the best production attained was on a boring mill, 3 hours being consumed. Becker Belt Driven Millers have cut this in half—1½ hours being the time consumed now on the same operation, and the finish is smoother, more accurate and better.

A similar saving may be possible in your plant—Investigate to-day—Now!

BECKER MILLING MACHINE CO.

HYDE PARK, BOSTON. MASS.

Canadian Agents:

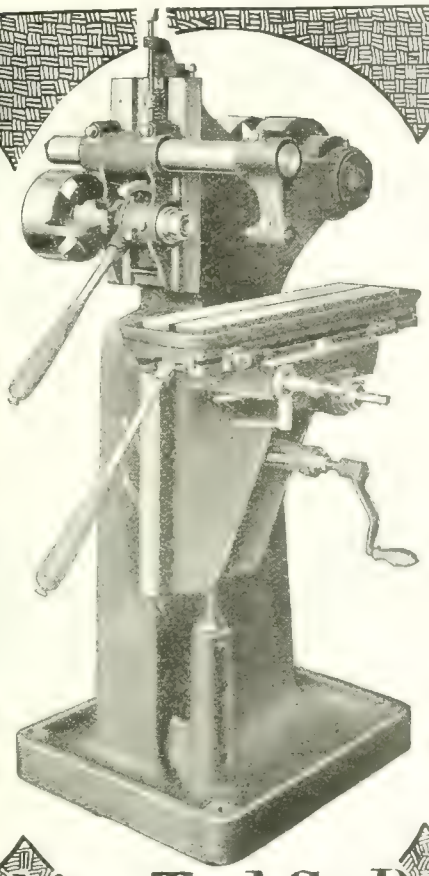
A. R. Williams Machinery Company, Limited - 64 Front St. West, Toronto
Rudel-Belnap Machinery Company, Limited - 137 McGill St., Montreal

The "BRISTOL" Hand Milling Machine

Extensively used in the manufacture of small parts where accurate duplication is essential. Illustration shows our number 1 Heavy Type Hand Miller.

Specially designed for use on work where heavier machine than standard type is necessary.

BRISTOL



Convenience Assures Big Production

The lever controls make a very convenient method of operation, though crank is furnished for table feed for use when so desired.

Users acknowledge these machines to be exceptional producers, proving in many cases more satisfactory than milling machines of the more expensive type.

Write for catalogue.

BRISTOL

The Bristol Machine Tool Co., Bristol, Connecticut

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"** —the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

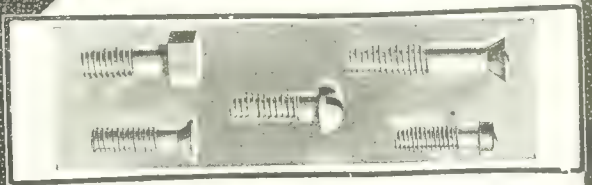
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

Wood Screw Making Machinery

SEND FOR CATALOGUE
Series B6



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

Write or Wire us.

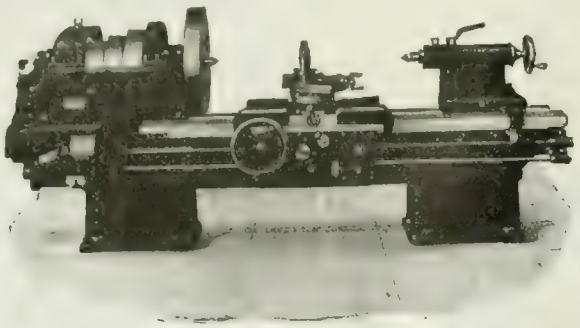
Cable address: "Cook,"
Hartford, U.S.A.
Codes: Liebers
Western Union

Asa S. Cook Co.
Hartford, Conn.

SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.

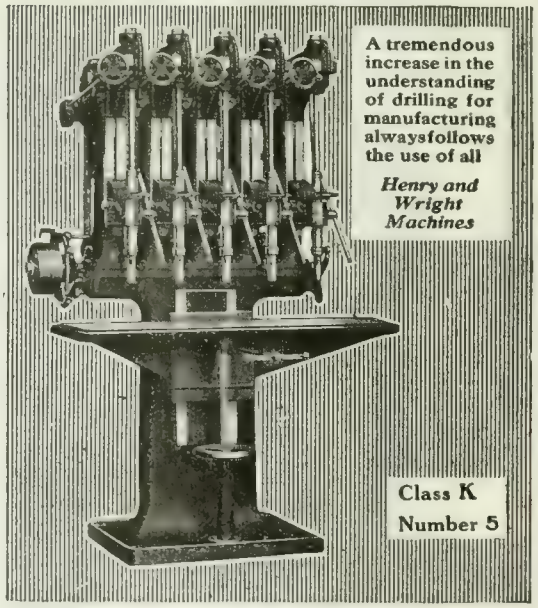
WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful **Waterbury Grinder** at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

The Blake & Johnson Co., Waterbury, Conn.

HENRY & WRIGHT

Drilling Machines



A tremendous increase in the understanding of drilling for manufacturing always follows the use of all *Henry and Wright Machines*

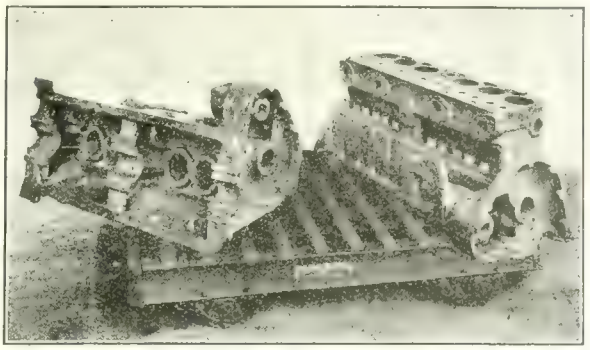
Class K
Number 5

The Henry & Wright Mfg. Co.

Hartford, Conn.

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

How long would it take to clean this Cylinder by your present methods—and what would be the labor cost alone?



How long would it take to pay for a Sand-Blast Installation from the saving in labor cost if you cleaned it in 3 minutes?

CLEANED IN THREE MINUTES BY

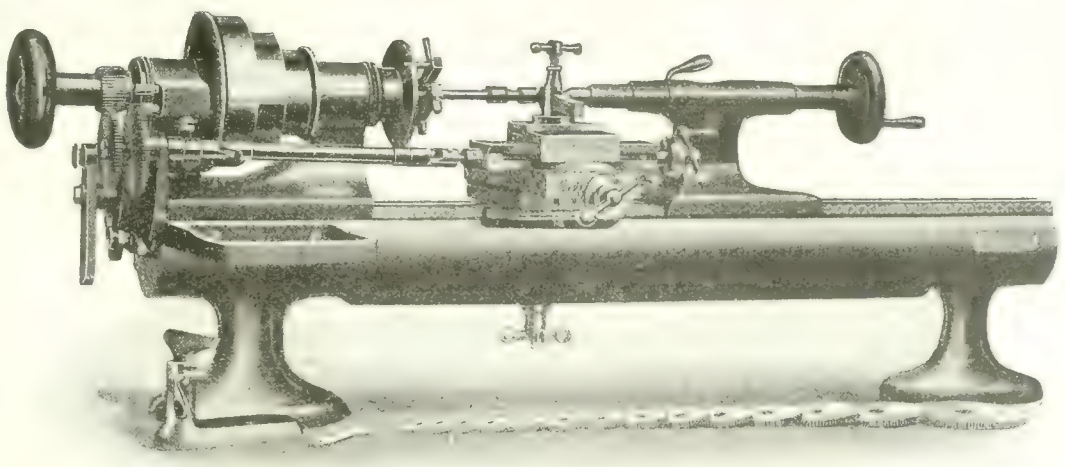
PANGBORN SAND BLASTS

and whether your requirements are the cleaning of Castings, Forgings, Stampings, Sheet, Plate or Structural, or the removal of scale from Heat Treated Parts there's a Pangborn Unit or Combination for every need, large or small, that will make a saving for you—and a more attractive product.

PANGBORN CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS
P. O. BOX 8503

CATARACT BENCH LATHES AND ATTACHMENTS

Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



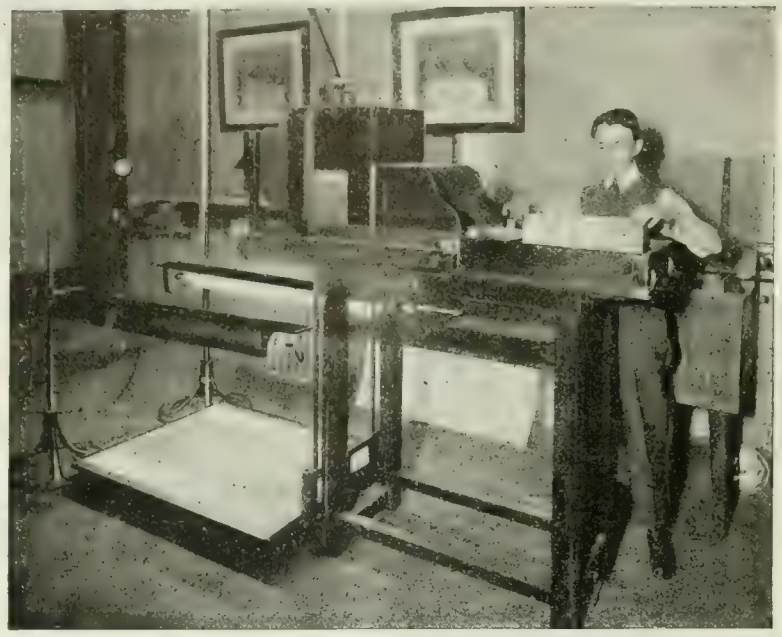
Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.

ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

Photographic Copying
The PHOTOSTAT
(Trade Mark Registered)

"Orders are now delivered three or four days earlier to our customers by making photographic copies of sketches and drawings which are the same in every detail instead of having our draftsmen reproduce the original.

"Practically all orders were previously held up three or four days by our drafting department while copies of the intricate drawings of ordered tools were being made. Now with the Photostat, only 15 or 20 minutes are required to make the three copies, exact duplicates of the original, which the factory needs to turn out the order. By eliminating this needless delay we are able to provide better service for our customers, and attract new prospects because of prompt deliveries."



This cut shows a PHOTOSTAT on which a large drawing has just been copied in less than a minute.

Never Makes a Mistake

It is simple, practical, easy to handle. Requires no expert knowledge. The machine is loaded with a roll of sensitized paper especially manufactured for the purpose.

The original subject is photographed directly upon this paper producing a facsimile copy which is immediately cut off, developed and fixed right in the PHOTOSTAT itself.

The focusing, exposing and developing are all controlled by simple mechanical devices and no glass plate, film or other intermediate negative has to be made.

After fixing, the copy is removed to a tank of running water and rapidly washed free from chemicals. It is then dried and is ready for use. As many copies as desired may be run off in this manner.

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AGENCIES:

Alfred Herbert, Ltd., Coventry, England
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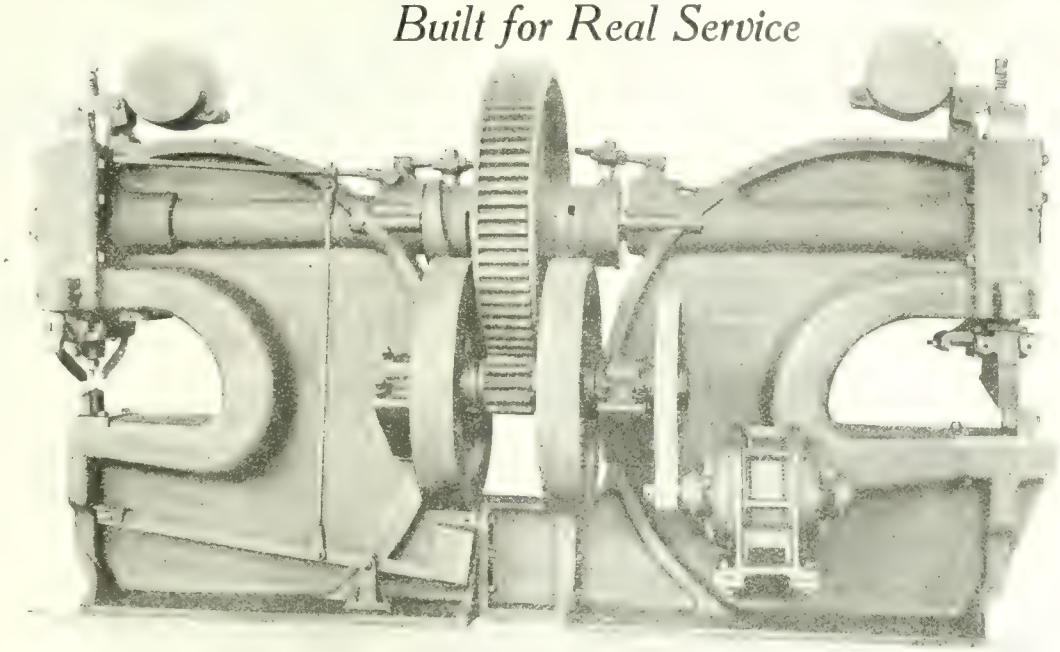
Graham Broters, Stockholm, Sweden

WICKES' Heavy Duty Double Punch

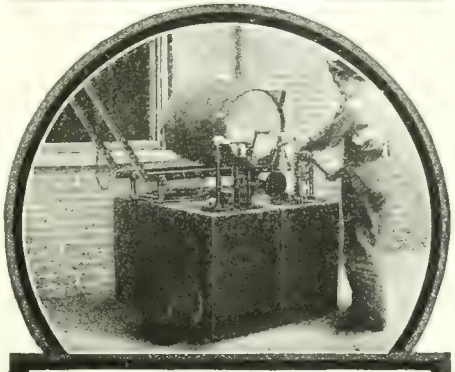
Built for Real Service



We also manufacture High Grade Horizontal and Vertical Rolls, Angle Rolls, Single Punches, Shears, Spruce Cutters Radial Wall Drills or Counter-sinking Machines, Flanging Clamps and Heavy Duty Engine Lathes. *Ask for Catalogue.*

WICKES BROS., SAGINAW, MICH., U.S.A.

Tiresome, Expensive, Dangerous, Wasteful—but Unnecessary.



With Bowser Equipment One Man Does the Work with Less Time and Effort —and Without Loss.

STOP WASTING LABOR IN HANDLING OILS

Do away with the back-breaking, disagreeable labor in storing and handling oils.

With Bowser Storage Equipment the heavy work is done mechanically—there is no wasted energy—all oils are easily and quickly put into storage by gravity.

Save With BOWSER Systems

Distribution is done by accurate, rapid self-measuring pumps—no oils are left in shipping containers to dry up, leak and seep away—none is lost through spilling or dripping faucets. Every operation in the use of oils is done in a systematic, safe and saving manner.

Write us for literature, showing why Bowser Systems are a paying investment

S. F. BOWSER CO., Limited

66-68 Frazer Avenue, Toronto, Ont.

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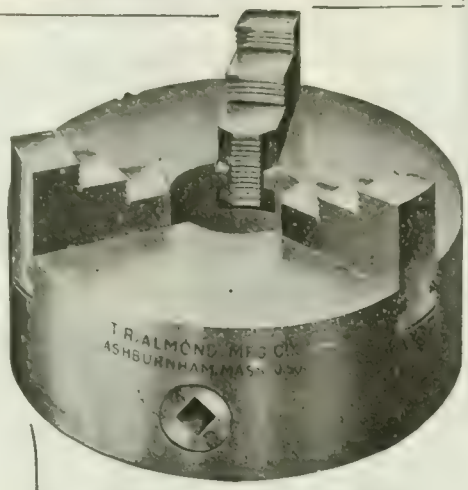
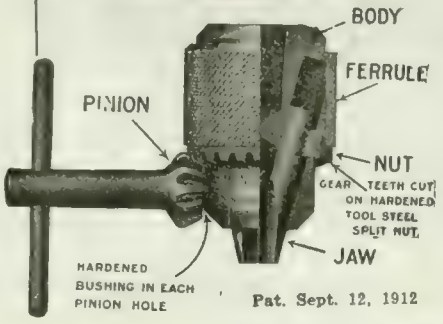
ALMOND
CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5", 6", 7½", 9" and 12".



Geared Nut Drill Chucks, in various capacities, 0" to 1".

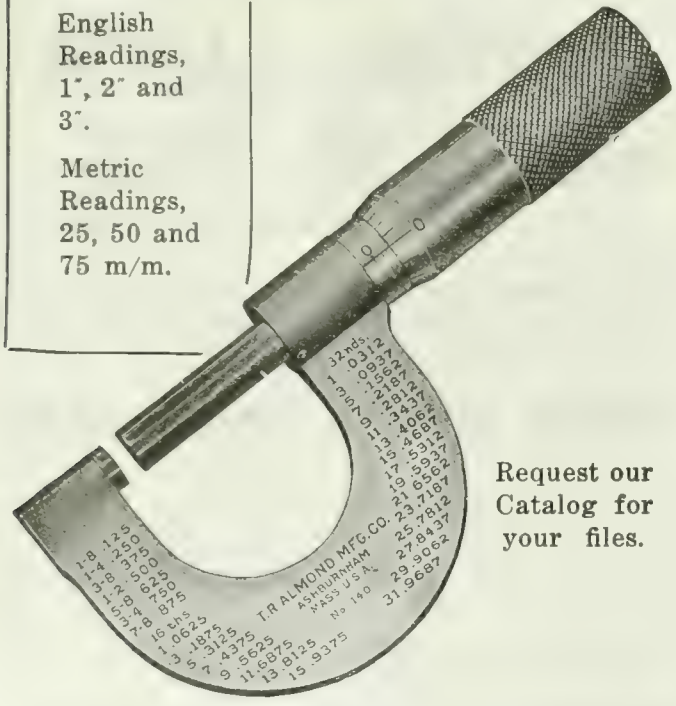


Pat. Sept. 12, 1912

Micrometer Calipers—

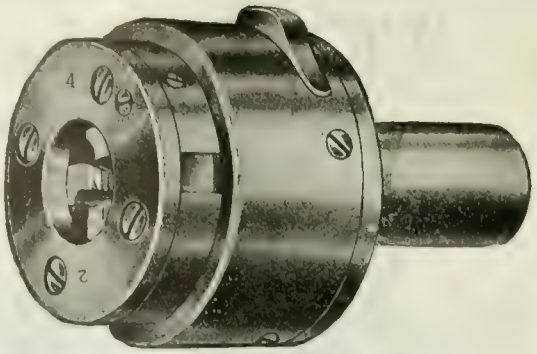
English Readings, 1", 2" and 3".

Metric Readings, 25, 50 and 75 m/m.



Request our Catalog for your files.

T. R. ALMOND MFG. CO.
6 Maple Avenue, Ashburnham, Mass.



H & G Die Heads

are of small outside diameter compared with the size of work they do.

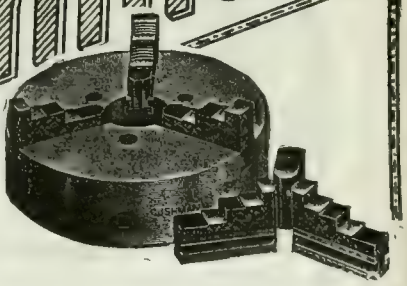
The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

Cushman



The "Cushman" Chuck of to-day is the fruit of nearly sixty years of Chuck building

And right from the start in 1862, they have been known throughout the industry for their high quality Material and Workmanship.

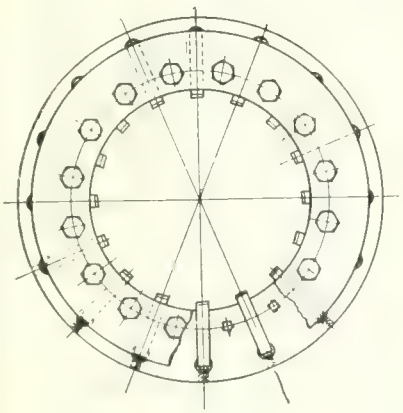
The CUSHMAN Chuck of to-day embodies every up-to-date improvement of a long line of FAMOUS CHUCKS.

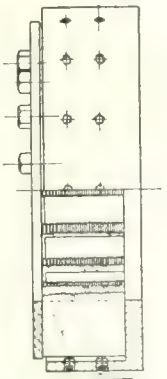
Send for our Catalogue showing complete line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws.

Cushman Chuck, Hartford, Co. Conn

CHUCKS

SMALLEY
GENERAL THREAD MILLER





Cuts Quality Milling Costs

Smalley-General Thread Miller reduces costs, increases output and improves the accuracy of the finished product. Accompanying blue-prints and time studies show results that should interest you.

MACHINE—Smalley General Thread Miller No. 1.

PIECE MILLED—Chasers for 8″ pipe die. Two sets milled at one time.

THREAD—Diameter, 8½″; length, 3⅝″; 8 pitch, Briggs, Ltd.

TIME STUDY—	Min.	Sec.
Inserting jig in chuck		30
Champfering for leading threads	5	
Milling roughing cut	13	
Finishing cut	8	
Removing jig from chuck		30
TOTAL TIME	27 minutes	

for two sets of chasers of 13½ minutes per set.

MILLING FEED—Roughing cut, 2″ per minute. Finishing cut, 3″ per minute.

MATERIAL—Rex A Tool Steel.

NOTE—Jig was arranged so as to hold two sets of chasers. Chuck was an air collet.

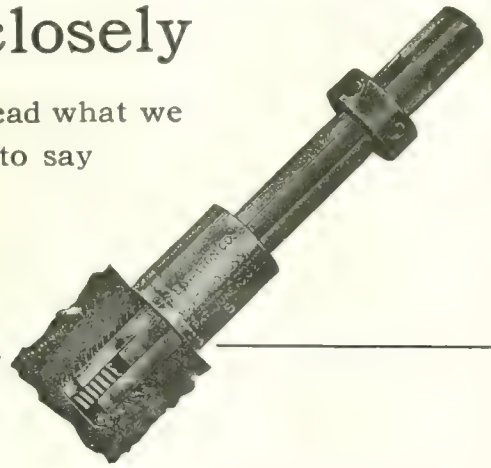
Consult us on every phase of thread milling. We will show you how to cut the costs.

Smalley General Company, Inc.
Bay City, Michigan

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

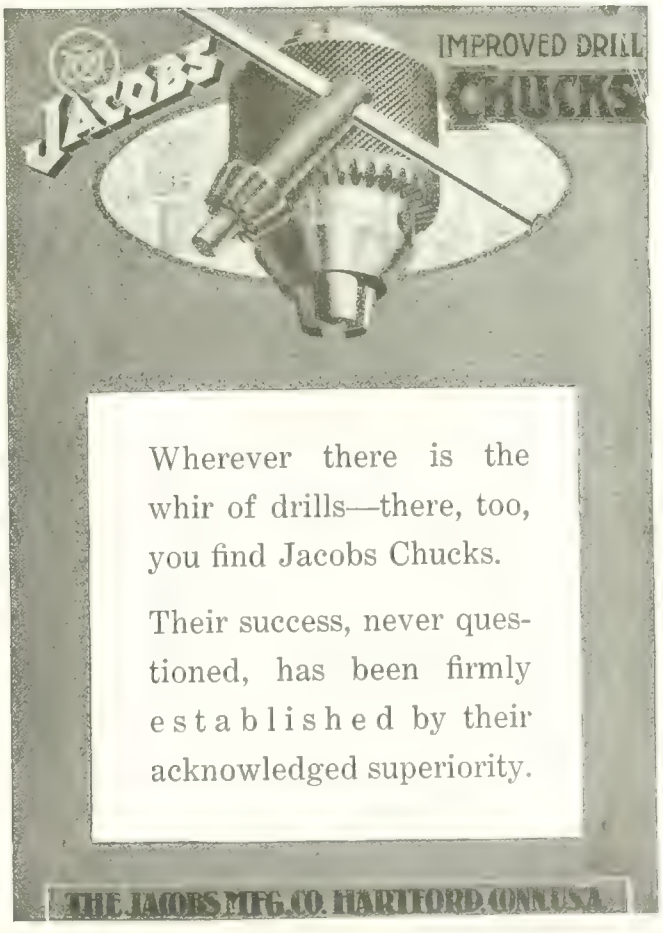
Look at this again —closely

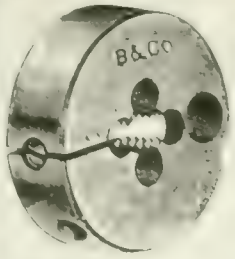
and read what we have to say below

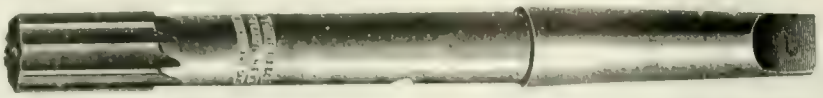


WHEN a tap breaks off close or below the surface, you'll find the Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

The Walton Company
Hartford, Conn.


JACOBS
IMPROVED DRILL
CHUCKS
Wherever there is the whir of drills—there, too, you find Jacobs Chucks.
Their success, never questioned, has been firmly established by their acknowledged superiority.
THE JACOBS MFG. CO. HARTFORD CONN. U.S.A.





Butterfield

Taps, Dies, Reamers, Drills, Milling Cutters

Butterfield quality gives the Maximum returns on your investment.

BECAUSE

It ensures **clean and accurate cuts** and will duplicate the work over a long period of use.
Butterfield Quality is the result of 35 years' continuous effort to keep our product distinctly in the lead from the standpoint of efficiency and economy.

SEND FOR OUR CATALOGUES.

Catalogue Seventeen covers Taps, Dies and Reamers. Catalogue "A" covers our line of Twist Drills, Gear and Milling Cutters.

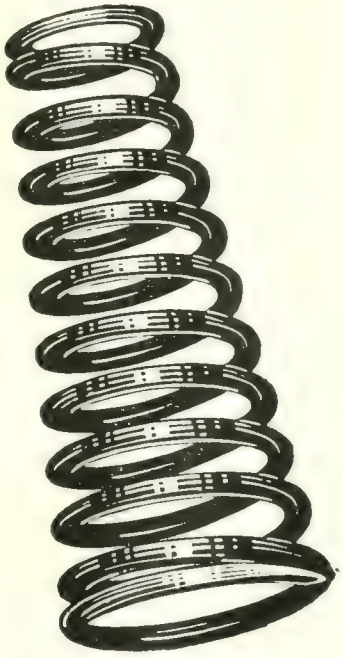
Butterfield & Co.
Inc., Rock Island, P.Q.
Toronto Office: 220 King Street West

Opportunity Knocks Here Every Week!

It may not knock for **you** this week, but read these pages regularly and grasp the opportunity when it presents itself. Every ad here is an opportunity for someone! Your time is coming. If you think the time is ripe to spring that little proposition of yours, send in your copy now for the next issue. If it is of interest to our readers, rest assured it will get attention.

CANADIAN MACHINERY
Classified Advertising Section
143 University Avenue TORONTO

The Wallace Barnes Company



"Barnes-made" for every trade

SPRINGS, WIRE & STEEL — EST. — "BARNES-MADE" PRODUCTS — 1857 — SCREW MACHINE PRODUCTS

Specialists to Solve Your Problem

The uniformity of our finished product, its absolute correctness in design, its lasting strength, is largely due to our engineering specialists.

Every man of the engineering personnel is an experienced and practical spring mechanic, yet a technically trained expert in the conception and design of springs.

This department's co-operation assures the invariable result; the production of the exact spring for the purpose — "Barnes-made" quality.

ESTABLISHED 1857

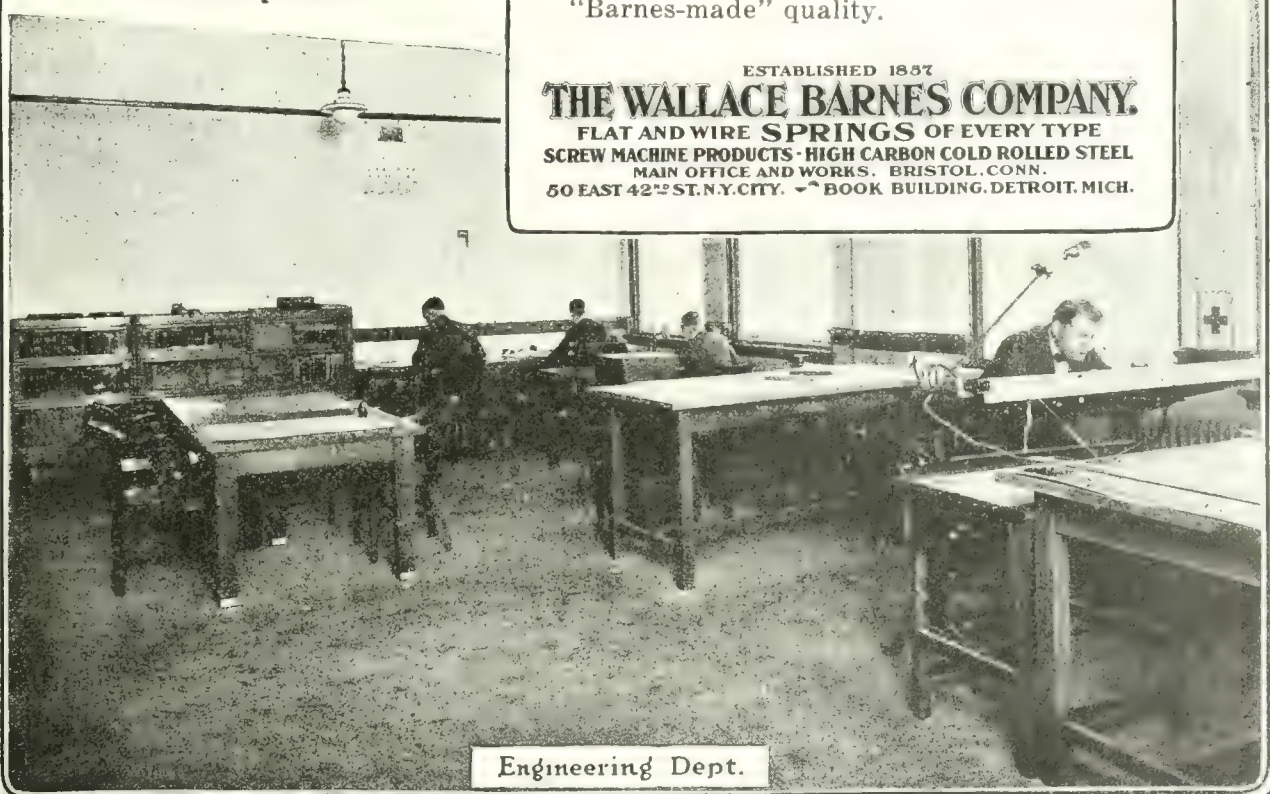
THE WALLACE BARNES COMPANY.

FLAT AND WIRE SPRINGS OF EVERY TYPE

SCREW MACHINE PRODUCTS - HIGH CARBON COLD ROLLED STEEL

MAIN OFFICE AND WORKS. BRISTOL, CONN.

50 EAST 42ND ST. N.Y. CITY. BOOK BUILDING. DETROIT, MICH.



Engineering Dept.

From East to West

And All Over the Civilized World

CISCO LATHES WERE SHIPPED IN JULY

Seattle, Washington and Boston, Mass.; Detroit, Michigan and Cuba; Youngstown, Ohio and Lansing, Michigan; Belgium and Spain; New York and Asia.

Mechanics know CISCO LATHES. They want and insist upon

The Lathe with the Pull
The Lathe of Simplified Accuracy

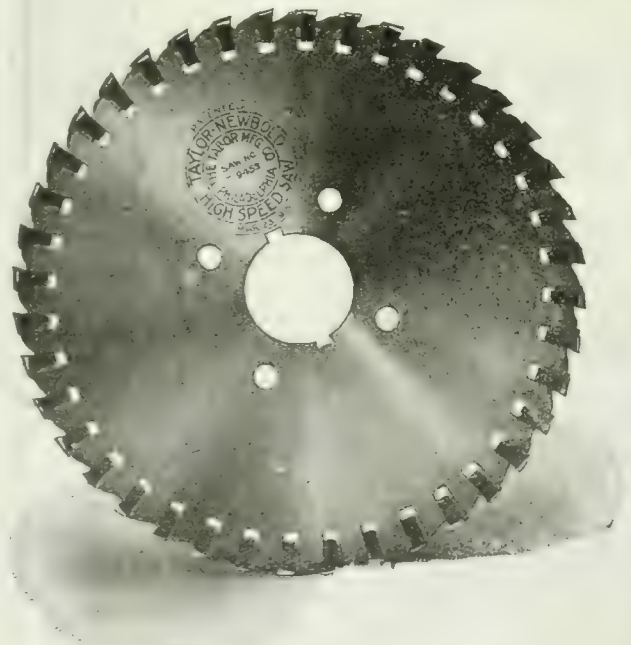
No Overhang, Rigid, Proportionately Uniform, Accurate, Simplest Operated Lathes Made. Repairs few, if any.

Built in sizes 14"-16"-18"-20"-24" Engine and Tool Room, Belt or Motor Driven, Geared Head Belt or Motor Driven.

The Cisco Machine Tool Company

CINCINNATI, U.S.A.

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

Don't Keep It--Sell It

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor
or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Avenue TORONTO, ONT.

Free Tool Grinding Chart

Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me/us free, one of your tool grinding charts.

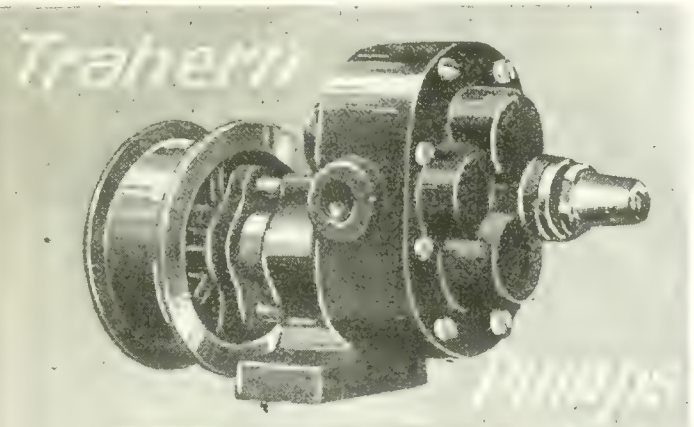
Signed.....

Firm Name.....

St. Address.....

City.....

Prov. .....



TRAHERN LUBRICATING PUMPS are for use on metal working machines of all kinds: planers, milling machines, gear hobbers, lathes, drill presses, saws, etc.

TRAHERN PUMPS are known to machine tool manufacturers the world over. Our customers are satisfied customers and install Trahern Lubricating Pumps on their machines as a regular equipment before leaving their factories.

Write for list of firms using TRAHERN PUMPS, then you will not have mere assertions but PROOF.

Try us and see that we have not overstated the facts.

Trahern Pump Co, Rockford, Illinois

60 Rivets in a Minute

Faster if the work can be fed faster.
But at least 60 every minute.
And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

GRANT

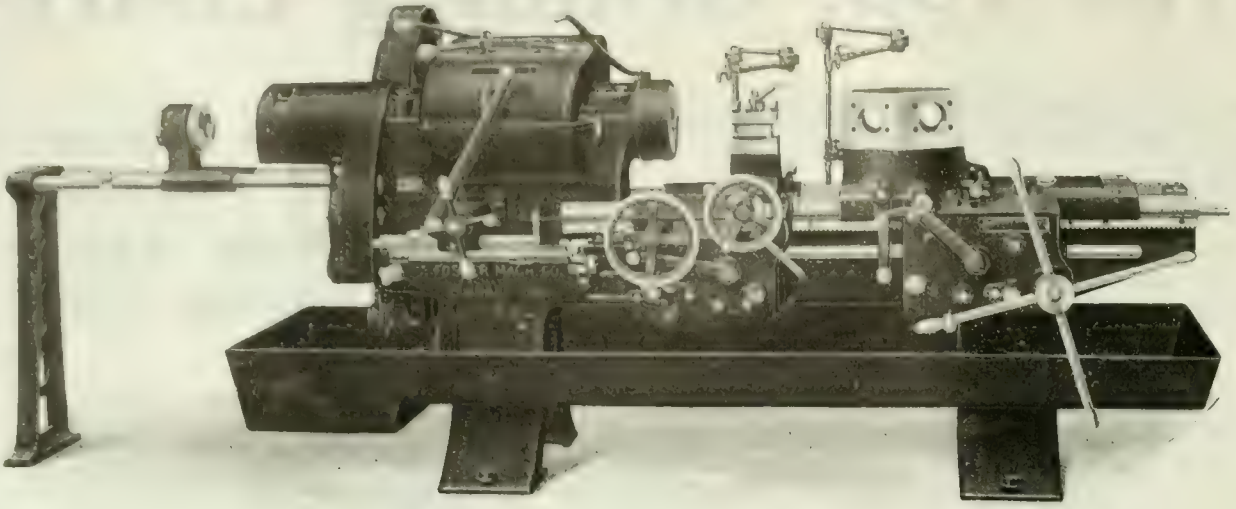
Rivet Spinning Machines

handle any rivet up to 1¼-in. shank.
If Grant-made, every hard steel rivet is finished as smooth and as true as every rivet of soft brass.
The Grant Book called "Perfect Riveting" tells how to give an extra appearance of quality to your product. For your copy

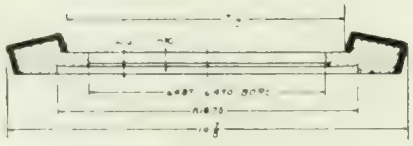
Write to-day

GRANT MFG. & MACHINE COMPANY
85 Silliman Avenue, Bridgeport, Conn.

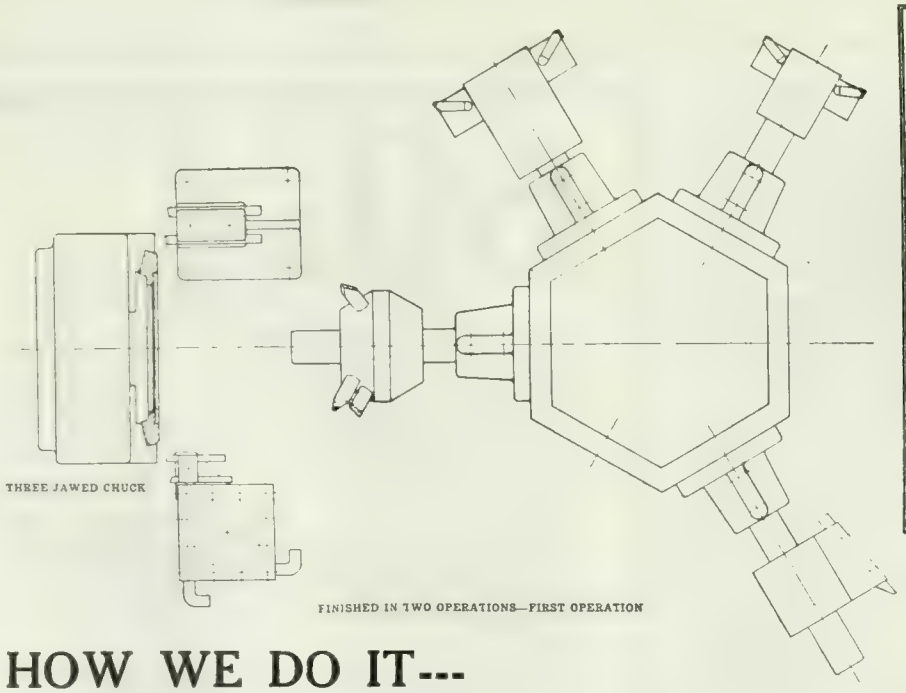
FOSTER TOOLS CUT PRODUCTION COSTS



2-B Universal Turret Lathe



RING BEVEL GEAR



THREE JAWED CHUCK

FINISHED IN TWO OPERATIONS—FIRST OPERATION

THE FOSTER LINE

No. 1-B UNIVERSAL TURRET LATHE
Bar Cap. 2" — Swing over Carriage, 14" over Cross Slide, 8"

No. 2-B UNIVERSAL TURRET LATHE
Bar Cap. 3¼" — Swing over Carriage, 20" over Cross Slide, 13½"

No. 3-B UNIVERSAL TURRET LATHE
Bar Cap. 4½" — Swing over Carriage, 28" over Cross Slide, 18¾"

No. 0 PLAIN HEAD SCREW MACHINE
Bar Cap. ⅞" — 10" Swing

No. 1 PLAIN HEAD SCREW MACHINE
Bar Cap. 1⅛" — 11" Swing

No. 2 PLAIN AND FRICTION HEAD SCREW MACHINES
Bar Cap. 1⅜" — 13" Swing

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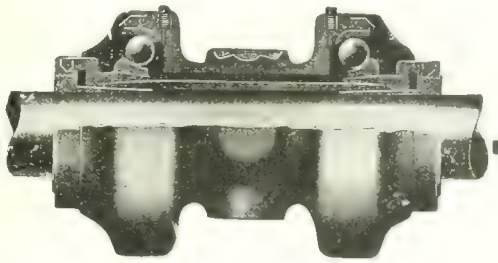

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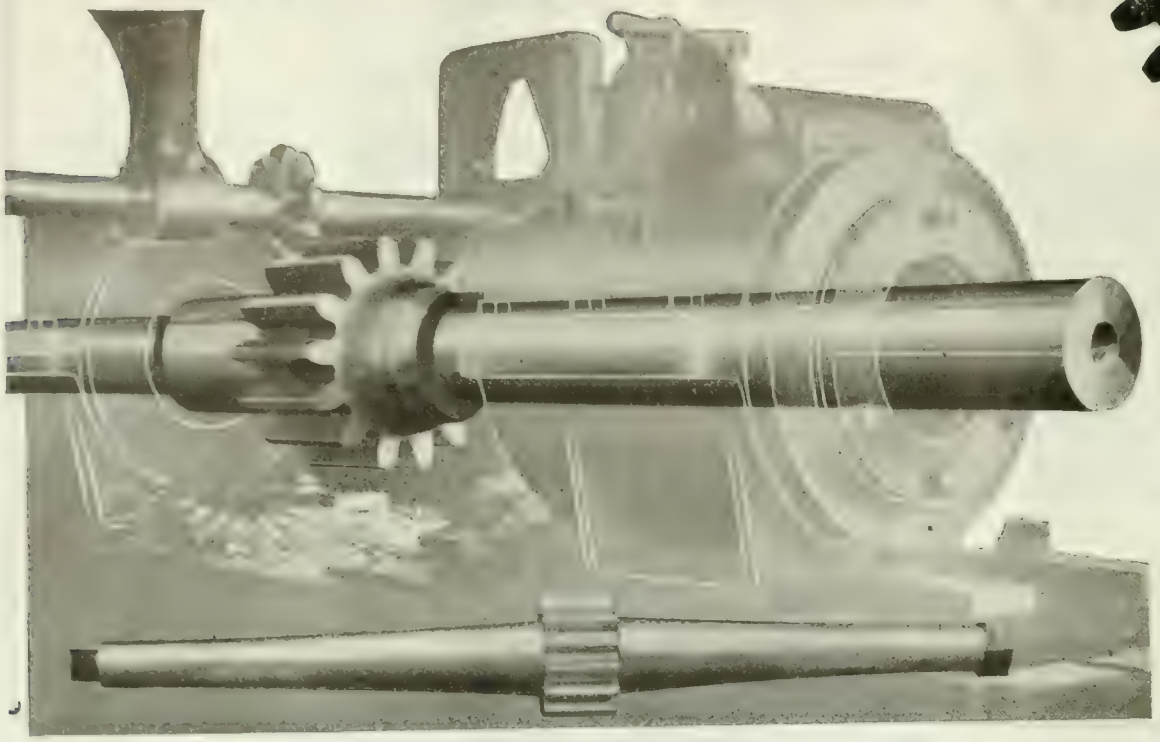

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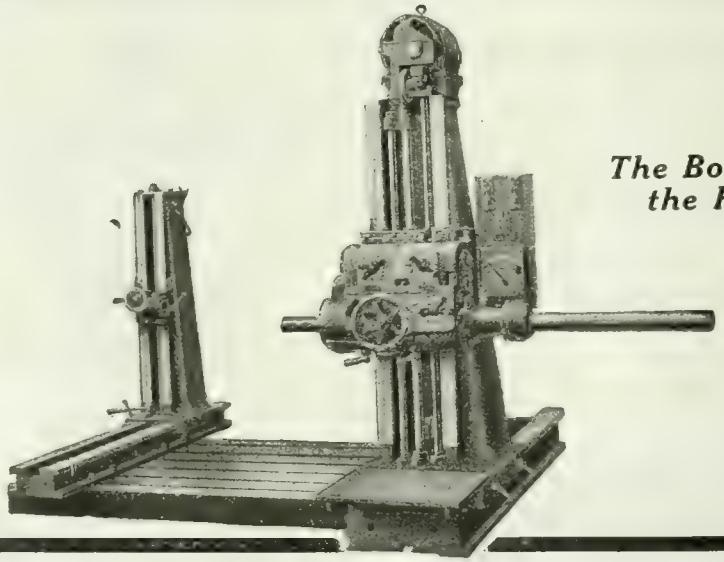

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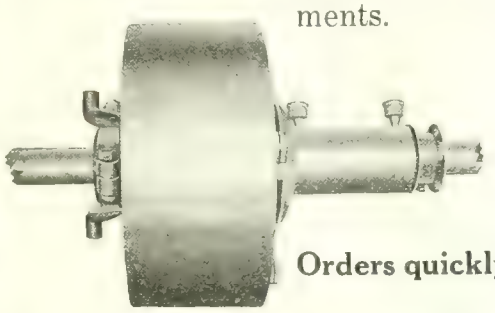

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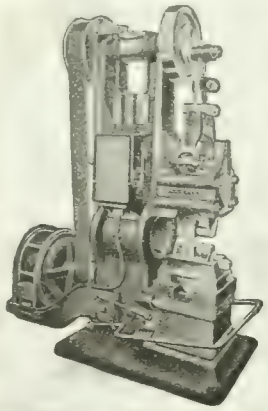

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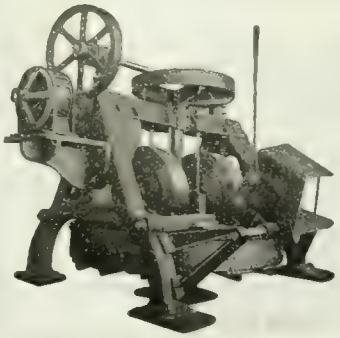

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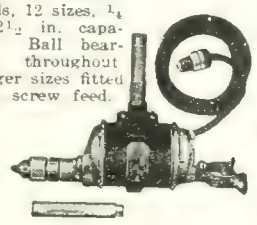

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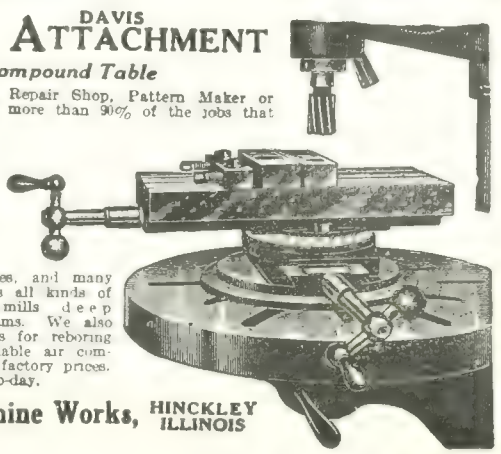

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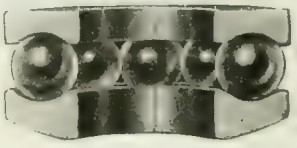

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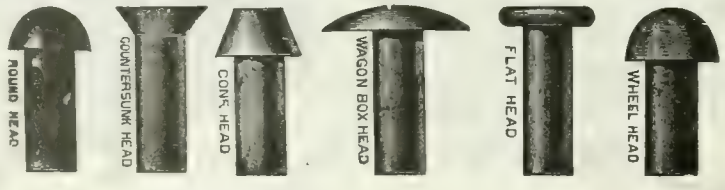

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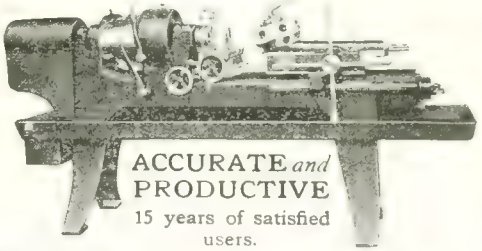
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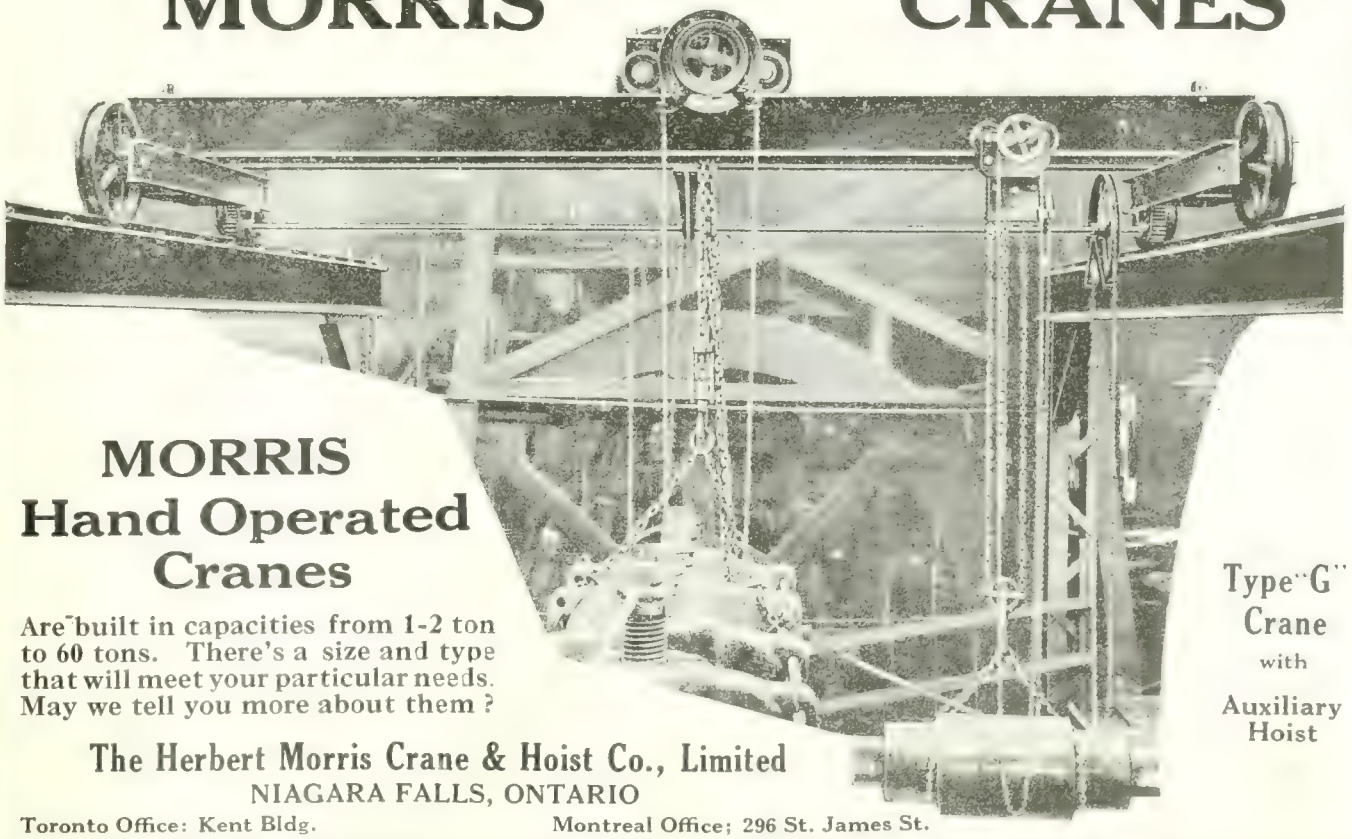
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Clipper Belt Lacer Co., Grand Rapids

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
G. E. Foss Mchy. & Sply. Co. Montreal
Graton & Knight Mfg., Worcester, Mass.
Rice Lewis & Son Toronto, Ont

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids

BELTING, BALATA
Federal Engineering Co., Toronto, Ont.

BELTING, RUBBER
Can. Consolidated Rubber Co. Montreal

BELTING, CHAIN
Can. Fairbanks-Morse Co. Montreal
Can. Link Belt Co. Toronto, Ont.
Lewis & Glasco, Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Ltd., Montreal, Que

BELTING, CONVEYOR
Can. Consolidated Rubber Co. Montreal
Baxter & Co., Ltd., J. R. Montreal
Canadian Fairbanks-Morse Co., Montreal
Peloton Engineering Co. Ltd. Toronto
Graton & Knight Mfg., Worcester, Mass
Jones & Glasco, Montreal, Que
McLaren Belting Co., J. C., Montreal.
Morse Chain Co. Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Williams & Wilson Ltd. Montreal, Que

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
John Tullis & Son Glasgow Scotland

BELTING, WOVEN
Federal Engineering Co. Ltd. Toronto

BENDING ROLLS, PLUTE & AUGH
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh Scotland
Bertram & Sons Co., John Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Garlock-Walker Mach. Co., Toronto.
Williams & Wilson, Ltd., Montreal.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles Bement Pond Co., New York
Tolhe Machine & Tool Co. Tolhe
Williams & Wilson Limited Montreal

BILLET MARKERS
Matthews & Co., Jas. H. Pittsburgh, Pa

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal
Algoma Steel Corp., Sault Ste. Marie.
Kayser-Ellison & Co., Ltd., Montreal
Marshall, Son & Bunney, Toronto
Norton, Ralph B., Agent, Montreal

BILLETS, FORGING
General Steel Co., Milwaukee, Wis
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Work, Ltd. Toronto, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLANKING
H. Hone & Son Co., Ltd. Peterboro

BLASTING MACHINES SHOT AND STEEL GRIT
Pangborn Corporation, Hagerstown, Md.

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
Massey & Massey, Ont.
Williams & Wilson, Limited, Montreal.

BLOCK, CHAIN AND ROPE
Fellows Bros., Ltd., Chadley Heath, Eng.

BLOCKS, CARGO
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BOARTZ
Jos. Kastel & Co. Inc., New York

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield, Mass

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Dominion Bridge Co. Montreal Que
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Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
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Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

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Aikenhead Hardware Co. Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

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Can. Winkles Co., Ltd., Windsor, Ont.
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BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

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Bertram & Sons Co., John, Dundas, Ont.
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Garlock Walker Machinery Co. Toronto
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio
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Williams & Wilson, Ltd., Montreal, Que.
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GEAR CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto, Ont.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich.

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy. & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., 1 Main St., Chester, Pa.
Hunter & Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Machy. & Supplies, Montreal.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto, Ont.

CUTTING OIL, RECLAIMING SYSTEM
Bowser & Co., Inc., Fort Wayne, Ind.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor, Ont.

CYLINDERS, AIR
Ford Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hancock Machine Co., Hancock, Ill.
Kelley Reamer Co., Cleveland, O.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Ont.
Niagara Falls, Ont.

DIAMOND TOOLS
Anderson & Co., of Can., Geo., Montreal
Ford Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City
Wheel Trueing Tool Co., Detroit
Williams & Wilson, Limited, Montreal

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pittsburgh Steel Stamp Co., Pittsburgh.

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Banfield, W. H., & Son, Toronto.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Montreal.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Windsor Mach. & Tool Co., Windsor.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRAWING
Henry Hope & Sons, Ltd., Peterboro, Ont.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
Barnes, W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
Blomquist-Eck Mach. Co., Cleveland, O.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Fry's (London), Ltd., London, Eng.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lyndl Farquhar Co., Boston, Mass.
Wickes Bros., Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

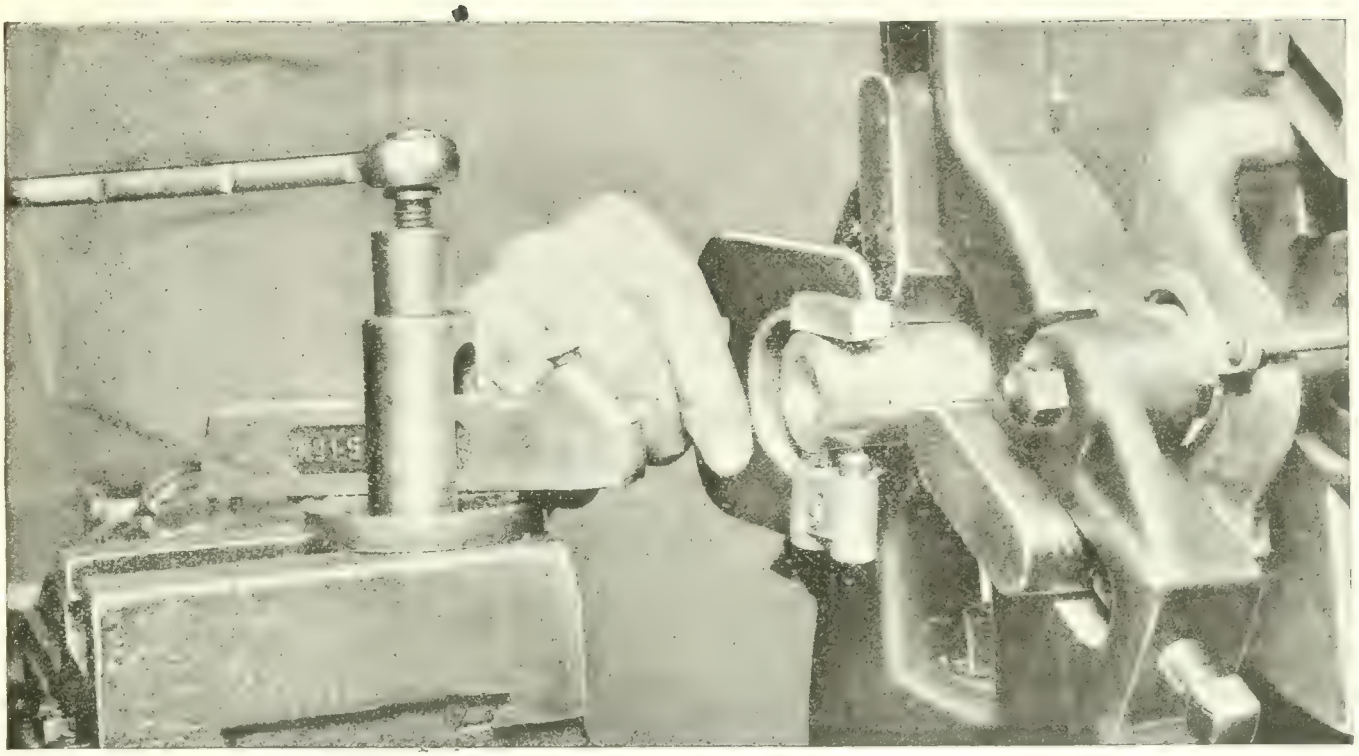
DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
McKenna Brothers, Pittsburgh, Pa.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Co., St. Catharines.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.



Adjustable External Limit Gage in Use in Turning Work

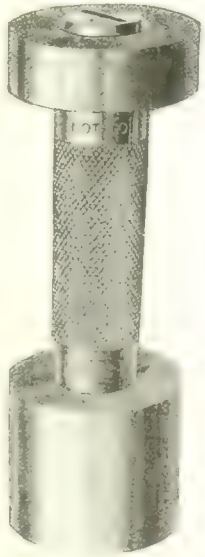
T-P Tool Room Specialties

Limit Gages of Unlimited Utility

External Limit Gage Style 31

External Limit Gages

Taft-Peirce External Limit Gages are made from tool steel drop forgings and are so designed as to be extremely rigid and yet have large, easy measuring surfaces. They are carried in sizes that are multiples of 1/16 in. up to 3 in.—adjustable gages to 7 in.—while other sizes are finished to customers' specifications.



Limit Plug Gage

Limit Plug Gages

Taft-Peirce Limit Plug Gages can be purchased from stock in all usual sizes and limits. The gage is made up of three units, a "Go" plug Style 11, a "Not Go" plug Style 12, and a handle Style 13, all of which are carried in stock sizes in multiples of 1/16 in. These plug members are so designed that they may be reversed on the same handle by simply removing the screw and turning the plug around. Larger and special sizes are made to order. Bulletin No. 104E describes the complete line of T-P gages and other tool room accessories. Ask for it.

TAFT-PEIRCE

Woonsocket, R.I., U.S.A.

New York: Woolworth Building 2072 Detroit: Majestic Building

Williams & Wilson, Limited, Montreal and Quebec

Canadian Fairbanks-Morse Co., Montreal
Cincinnati Electrical Tool Co., Cincinnati.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. R. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., Joseph Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK

Can. Ingersoll Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal
A. R. Williams Machy. Co., Toronto

DRILLS, TRACK

Cleveland Twist Drill Co., Cleveland
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN

See Belting, Chain.

DRIVING TOOLS

The Thos. Firth Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM

Bowser & Co., Inc., Fort Wayne, Ind.

DRYERS, SAND

Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES

Baird Machine Co., Bridgeport, Conn.

DRUM CONTROLS

Elec. Steel & Metals, Ltd., Welland, Ont.

DUMP CARS

Canadian Fairbanks Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER, ARRESTER SYSTEM

Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT

Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS

Can. Blower & Forge Co., Kitchener, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES

Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES

Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACE

Electric Steel & Metals, Ltd., Welland.
General Steel Co., Milwaukee, Wis.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.

Can. Driver-Harris Co., Walkerville, Ont.

ELEVATOR, ENCLOSURES

Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS

Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS

Can. Link Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES

Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS

Brantford Emery Wheel Co., Brantford, Canada
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS

Wood Turning Tool Co., Windsor, Ont.

END MILLS

John Morrow Screw & Nut Co., Ingersoll

ENGINES, STEAM, GAS, GASOLINE

Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL

Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE

Can. Ingersoll Rand Co., Sherbrooke, Que.

ENGRAVERS

Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS

Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS

Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks Morse Co., Montreal

EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que

EXTRACTORS, TAP

Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS

Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS

Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES

Page Steel & Wire Co., Adrian, Mich.

FANS

Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE

Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY

Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN

Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES

Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont
Standard Machy. & Supplies, Montreal.
Simonds Mfg. Co., Fitchburg, Mass.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL

Bowser & Co., S. F., Fort Wayne, Ind.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRST AID CABINETS

Strong, Kennard & Nutt Co., Cleveland.

FIRE BRICKS

Harbison-Walker Refractories Co., of Canada, Montreal, Que.

FIRE EXTINGUISHERS

Strong, Kennard & Nutt Co., Cleveland, O.

FIXTURES

Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS

Wickes Bros., Saginaw, Mich.

FORGES, HAND PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON

Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING

Victoria Foundry Co., Ottawa.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL

Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING

H. Hope & Sons of Can., Ltd., Peterboro

FOUNTAINS, DRINKING

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS

Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING

Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS

Bowser & Co., S. F., Inc., Fort Wayne.
Gilbert & Barker Mfg. Co., Springfield.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING

Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST

Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING

Gilbert & Barker Mfg. Co., Springfield.
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL,

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING

Standard Fuel Engr. Co., Detroit, Mich.

FUSE BOXES, STEEL

Dom. Forge & Stamp. Co., Walkerville.

GANG PLANER TOOLS

Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.

Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS

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GASOLINE TANKS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING

Bowser & Co., S. F., Inc, Fort Wayne.

GAUGES

Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS

Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT

Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD

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Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE

Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL

C. E. Johanson, Inc., Toronto, Ont.

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Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST

Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS

Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY

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Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE

Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL

Bridgeford Mach. Tool Wks, Rochester.

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GEARS, CHAIN

Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING

Morse Chain Co., Ithaca, New York.

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Can. Link Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glasseo, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

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Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glasseo, Montreal.
Philadelphia Gear Works, Philadelphia.
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Can. General Electric Co., Toronto, Ont.

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Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

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Strong, Kennard & Nutt Co., Cleveland.
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Rice Lewis & Son, Toronto.

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Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
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Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
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Williams & Wilson, Limited, Montreal.

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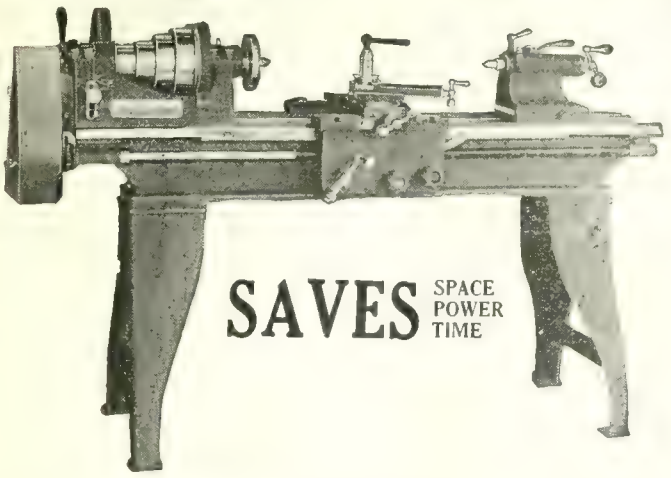
Garvin Machine Co., New York
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.



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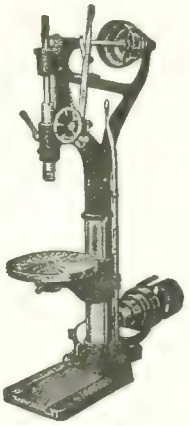

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Northern Crane Works, Walkerville, Ont.
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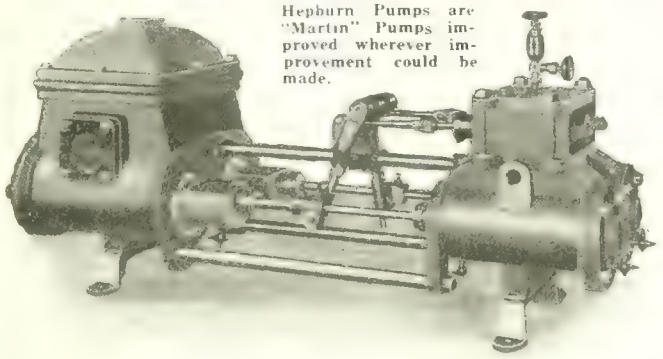

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INTRA STEEL GIBRALTAR STEEL
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Matthews & Co., Jas. H., Pittsburgh, Pa.

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Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
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Fox Machine Co., Jackson, Mich.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
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Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
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Pratt & Whitney Co., Dundas, Ont.
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Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
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Fox Machine Co., Jackson, Mich.
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Pratt & Whitney Co., Dundas, Ont.
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Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
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Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Garlock Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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NICKEL STEEL
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Hall & Son, J. H., Brantford, Ont.
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Landis Machine Co., Waynesboro, Pa.
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See Guards

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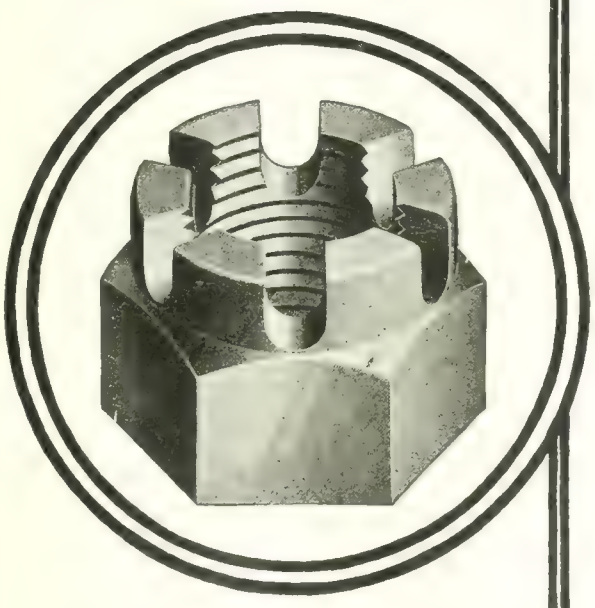

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Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Medberry Co., R. G., [illegible]
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Foss Mchy. & S'ply Co., G. F., Montreal
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
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Independent Pneumatic Tool Co., Chicago.

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Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Link-Belt Co., Toronto, Ont.
[illegible] Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

POWER TRANSMISSION MCHY.

Williams & Wilson, Ltd., Montreal, Que.

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Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Toledo Machine & Tool Co., Toledo.

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Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York
Perrin, Ltd., William R., Toronto
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC

Bertram & Sons Co., John, Dundas
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
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West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal
Consolidated Press Co., Hastings, Mich
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

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Barnes & Co., W. F. & Jno., Rockford, Ill.
Bliss Co., E. W., Brooklyn, N.Y.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS

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PSYCROMETERS, SLING

Taylor Instrument Co., Rochester, N.Y.

PULLEYS

Algoma Steel Corp., Sault Ste. Marie, Ont.
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal
Ford Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Standard Mach. & Supplies, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT

American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH

American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY

MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, CENTRIFUGAL

Bowser & Co., Inc., S. F., Toronto.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, FUEL OIL

Bowser & Co., Inc., Toronto, Ont.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED

Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE

Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC

Garlock Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE

Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, RUBBER CEMENT

Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, KEROSENE, OIL, SELF-MEASURING

Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, LUBRICANT, OIL, WATER

Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD

Fry's (London), Ltd., London, England.

PUMP LEATHERS

Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES

Atkins & Co., Ltd., Wm., Sheffield, Eng.
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H, Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND

Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER

John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHING MACHINES, HORIZONTAL

Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PYROMETERS

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Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES

Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS

Algoma Steel Corp., Sault Ste. Marie, O.
Niles-Bement Pond Co., New York.

RAILROAD TOOLS

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

RASPS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS

Atkins & Co., Ltd., Wm., Sheffield, Eng
Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS, ADJUSTABLE

Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Standard Mach. & Supplies, Montreal.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Co., St. Catharines.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED

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Aikenhead Hardware Co., Toronto.
H. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

REAMERS STEEL, TAPER AND SELF-FEEDING

Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, CHUCKING

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.

REAMERS, HAND

Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, PIN

Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

REAMER FLUTING MACHINES

Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC

Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS

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Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.

American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC

Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE

Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

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Strong, Kennard & Nutt Co., Cleveland.

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Aikenhead Hardware Co., Toronto, Ont.
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Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

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Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

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Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME

Can. Driver Harris Co., Ltd., Walkerville.

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John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

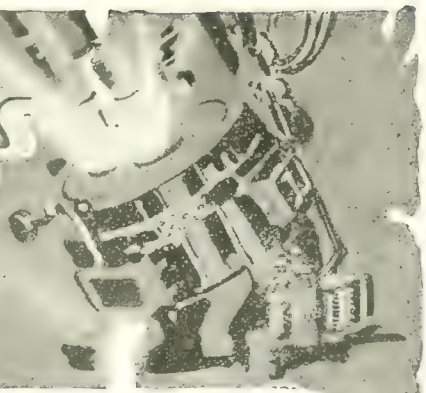
ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD

Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS

The Quickwork Co., St. Mary's, Ohio.

Nichrome Castings for Heat Treatment



Cast "Nichrome" and Ferrous Materials For Heat Treatment

The performance of cast iron, cast steel, structural steel and wrought iron in heat treatment has never been satisfactory. Ferrous castings contain blow holes, slag inclusions, sand and foreign material, all of which affect the time rate of heat penetration. The repeated heating and cooling of ferrous materials from room temperature to 1800° F. for several hours results even in a reducing atmosphere in the material becoming blistered, burned, cracked and covered with scale; thereby producing thin spots in the walls and ultimately holes are burnt through.

Under the influence of heat, Cast Nichrome DOES NOT CRACK, GROW, WARP or SCALE. Being heat resisting and durable, it minimizes and practically eliminates costly expenditures for repairs and maintenance. The life of carbonizing boxes and other heat treating containers is 25 to 48 times that of ferrous materials under the severest conditions.

Write for further particulars.

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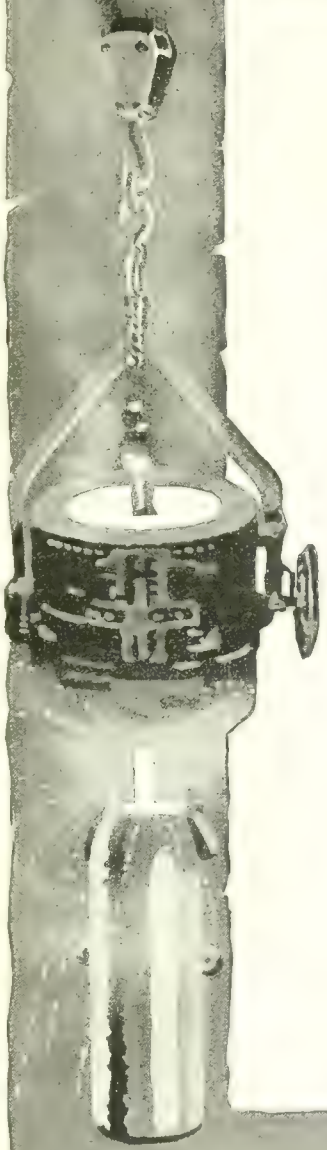

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RULES, BOXWOOD, FOLDING
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RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

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Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
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Foos Mfg. Co., Chicago, Ill.

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Pittsburgh Crushed Steel Co., Pittsburgh.

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Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Pure Sanitary Drinking Fountain Co., Hagaborville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

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Canada Machinery Corp., Galt.
Robert Gardiner & Son, Montreal.
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Marshal Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
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Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
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A. B. Jardine & Co., Hespeler.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
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Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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National Acme Co., Montreal.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

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John Morrow Screw & Nut Co., Ingersoll.

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Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice, Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

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National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

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See Dies.

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Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

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John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Williams & Wilson, Ltd., Montreal.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Rice, Lewis & Son, Toronto.

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Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

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SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEET METAL ROLLING MACHINES
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Can. Driver-Harris Co., Ltd., Walkerville.

SHEARS, PLATE CUTTING, SLITTING
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
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Peck, Stow & Wilcox Co., Southington, C.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
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Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal.

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Kayser Ellison & Co., Ltd., Montreal.
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D. H. Stoll Co., Inc., Buffalo, N.Y.

SHELVING, STEEL
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SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

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Jones & Glassco, Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

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Modern Tool Co., Erie, Pa.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

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Katie Foundry, Galt, Ont.

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Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
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Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

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Jones & Glassco, Montreal.

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Cleveland Wire Spring Co., Cleveland.
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Garlock-Walker Machinery Co., Toronto.
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Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Garvin Machine Co., New York.
Gooley & Eglund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Marten Machine Co., Hamilton, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Wilson & Co., J. C., Belleville, Ont.
William R. Perrin, Ltd., Toronto.
Windsor Mach. & Tool Co., Windsor, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

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Sleeper & Hartley, Inc., Worcester, Mass.

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Morse Chain Co., Ithaca, New York

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

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Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia.
Wilson & Co., J. C., Belleville, Ont.

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Perrin, Wm. R., Toronto.
Wilson & Co., J. C., Belleville, Ont.

SPROCKET WHEELS, CHILLED THREAD
Katie Foundry, Galt, Ont.

SQUARES
Peck, Stow & Wilcox Co., Southington, Conn.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich.

STAYBOLT TOPS
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Wells Bros. of Can., Galt, Ont.

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Dom. Forge & Stamping Co., Walkerville
Hope & Sons, Henry, of Canada, Peterboro, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H & Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.

STEEL BALLS
See Balls Steel.

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Kayser-Ellison & Co., Ltd., Montreal.
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Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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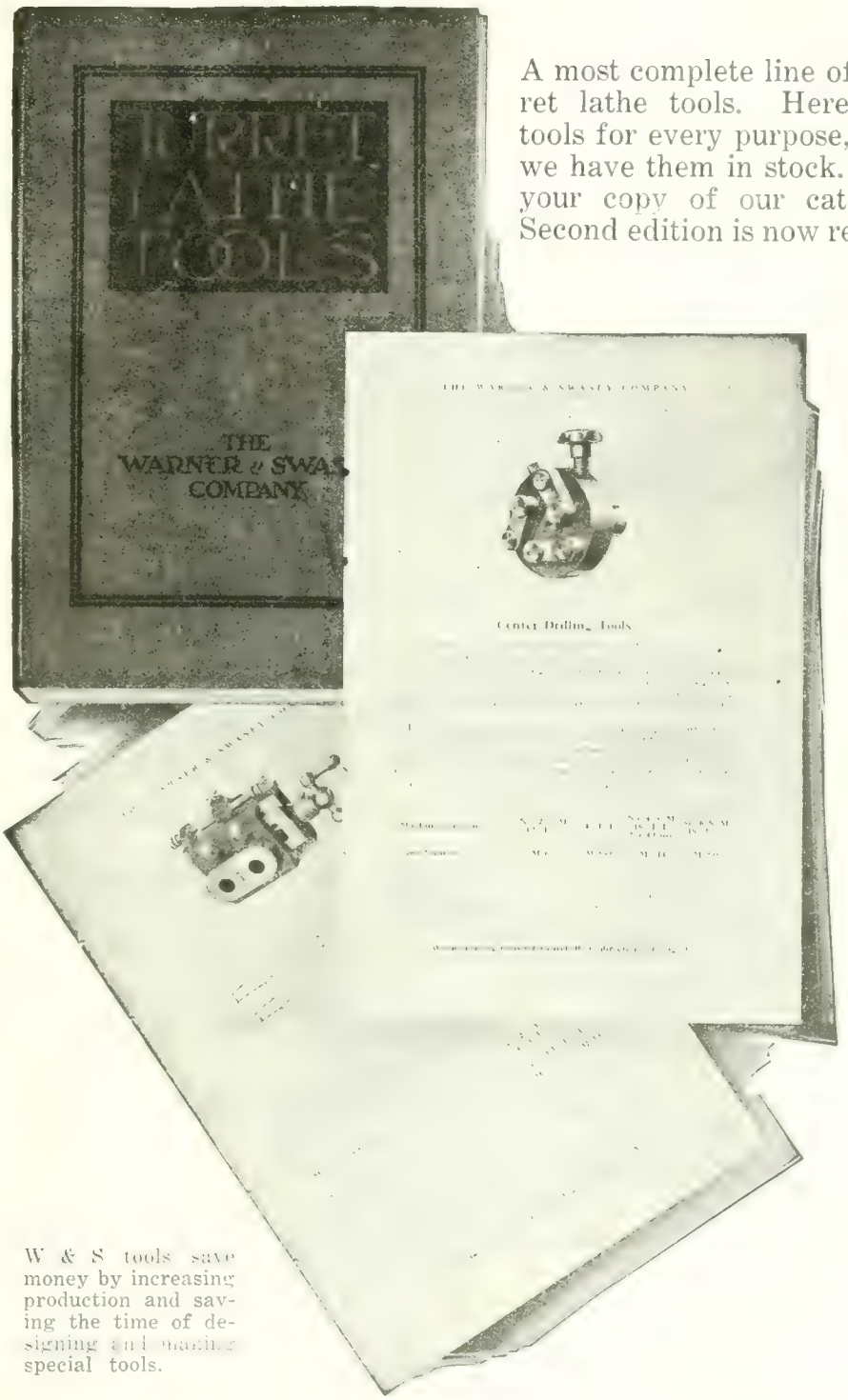

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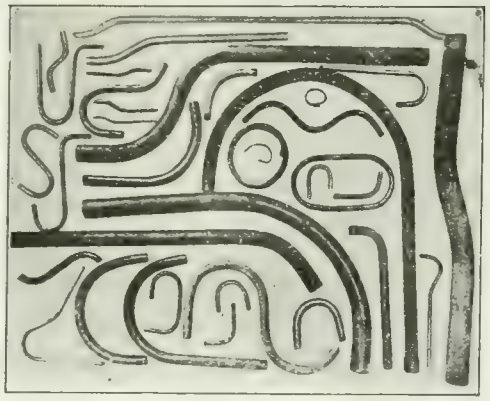

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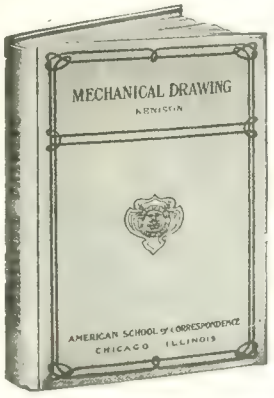

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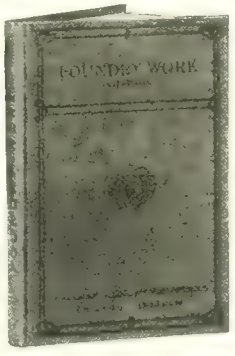

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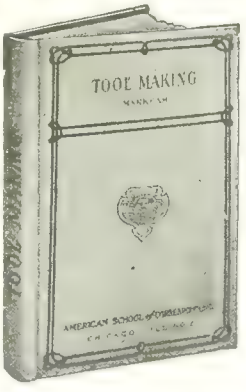

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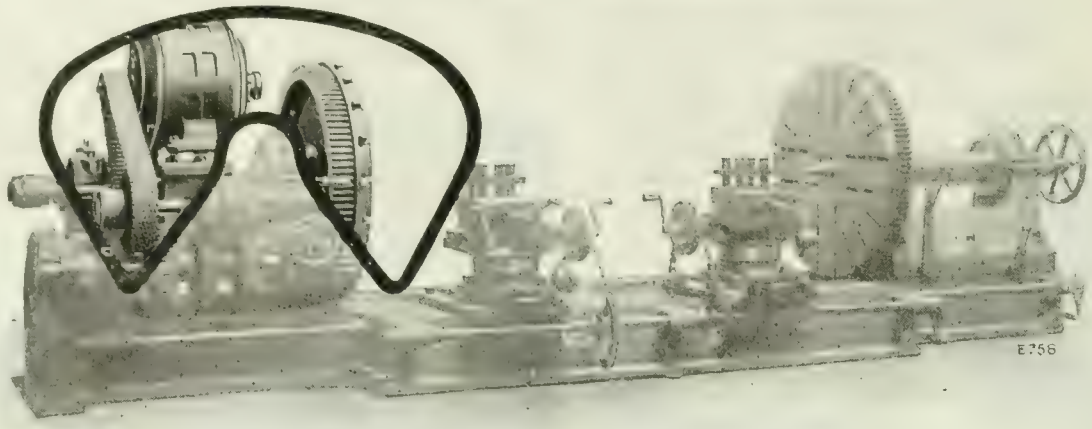

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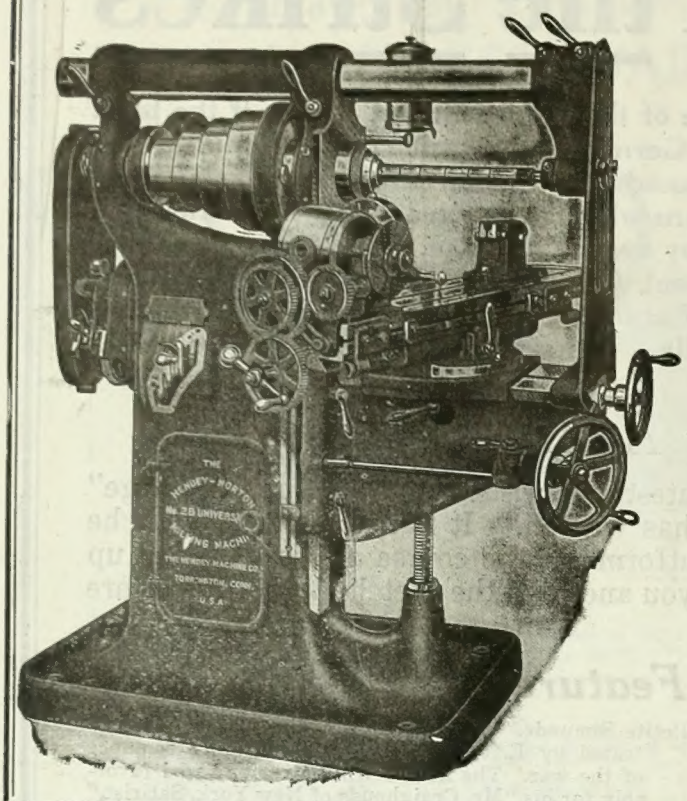

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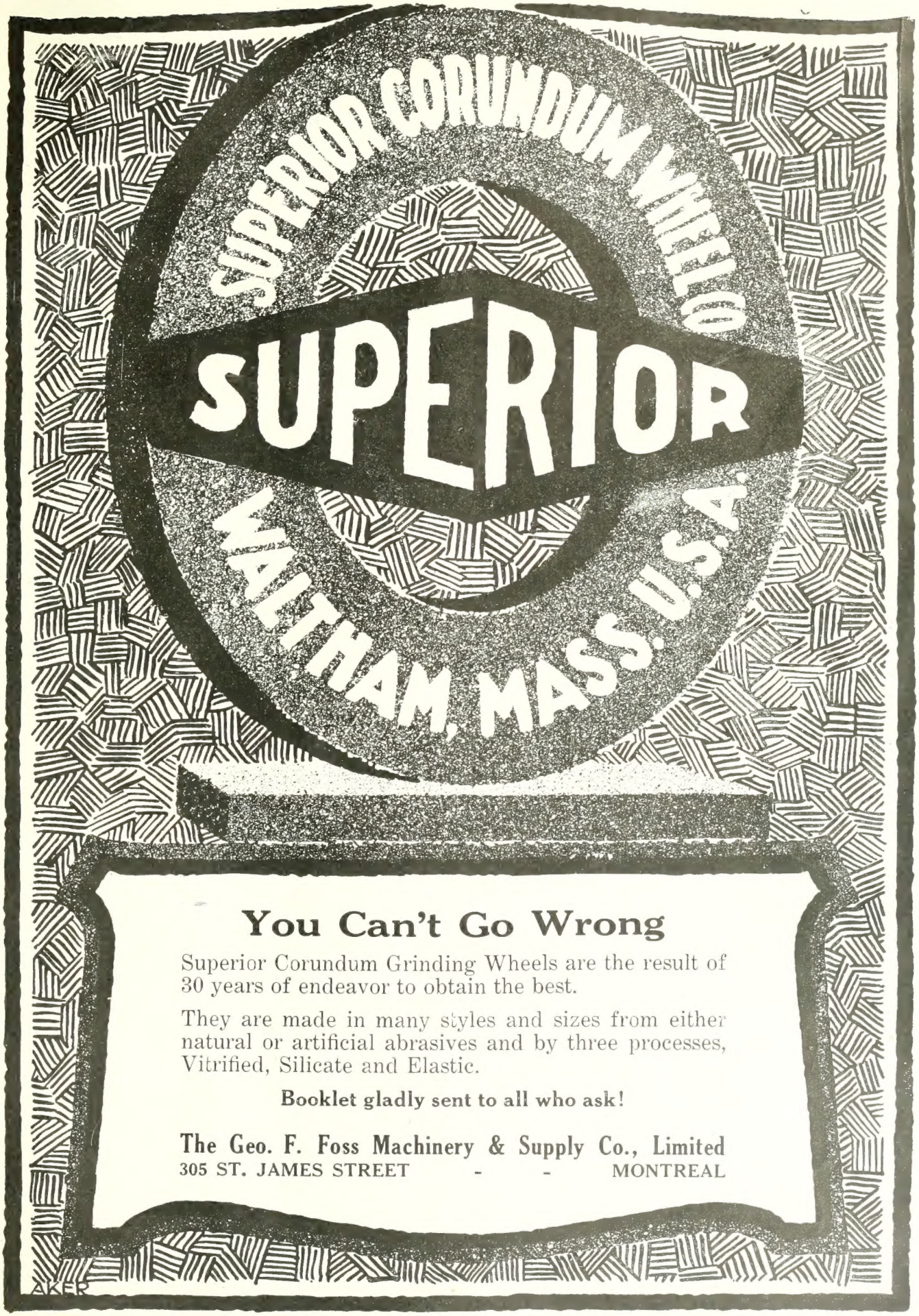

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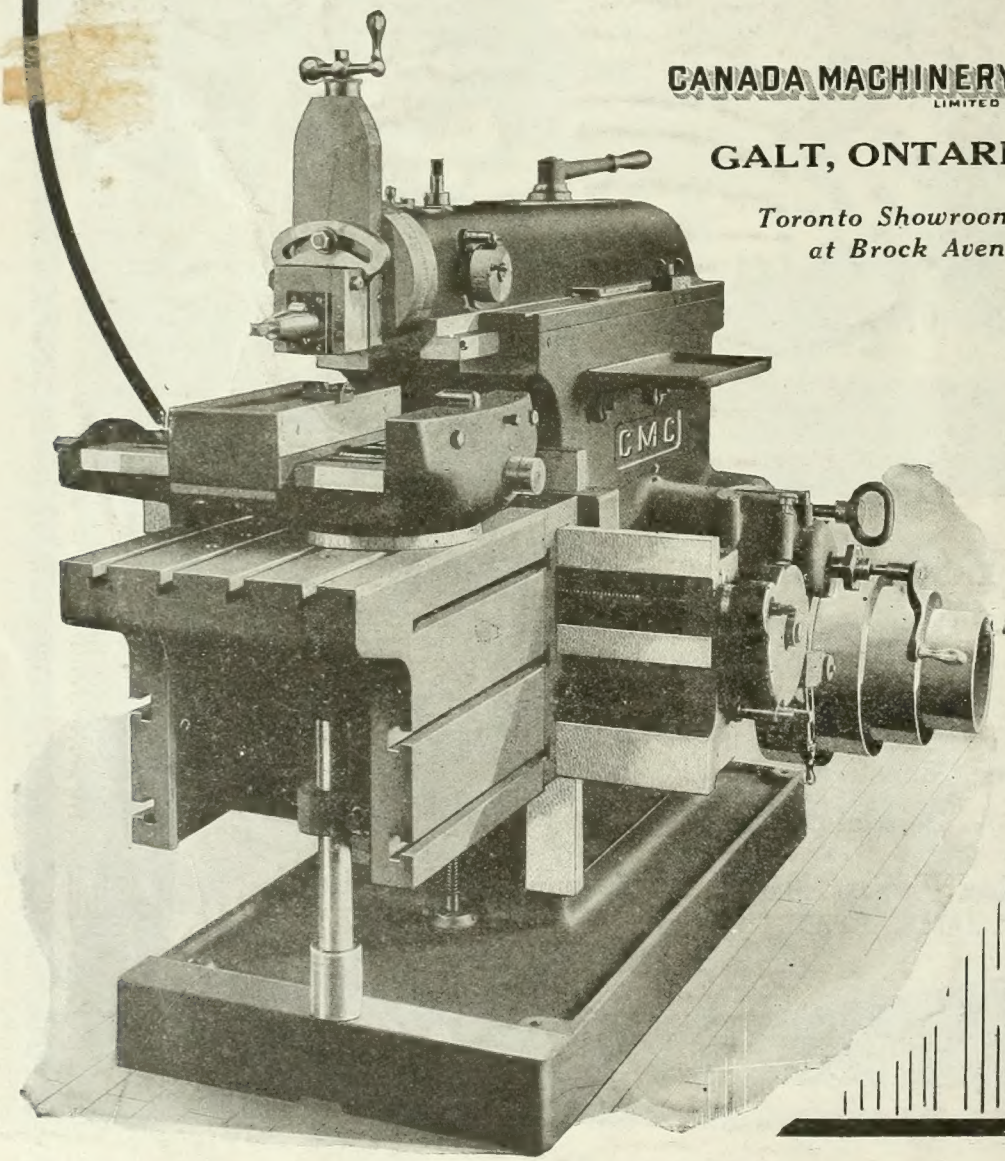

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